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ABSTRACT

The impact of Brown University on the economic base of Providence, Rhode Island and on the state was studied. Data are based on 1978 university and public records and results of a 1976 university survey, adjusted by Consumer Price Indexes. A set of mathematical models was used to measure effects of the university on three major sections of the city and state: business, city and state government, and private individuals. The economic impacts on the business sectors are considered in relation to: university-related local and state business volume; value of local and state business property committed to university-related business; expansion of the state banks; credit base resulting from university-related deposits; and local business volume unrealized because of the existence of university-related enterprises. Governmental impact are examined in relation to: university related revenues received by local and state government; the value of municipal services self-provided by the university; cost of municipal services allocable to university-related influences; value of local government property allocable to the university-related portion of services provided; and taxes forgone through the tax-exempt status of the university. Finally, three main ways that the university affects individuals are through jobs and employment opportunities created, income of individuals from business activities, and goods procured with income from university-related jobs and business activities. Among the findings is the following: total direct and indirect expenditures in Rhode Island attributable to Brown in 1978 were $103 million, of which nearly $62.5 million was spent in Providence alone. Models, estimating procedures, and data sources are described, and a questionnaire is appended. (SW)

ED216618

Economic Impact Study

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THE ECONOMIC IMPACT OF BROWN UNIVERSITY
ON THE CITY OF PROVIDENCE
AND ON THE STATE OF RHODE ISLAND

Gina S. McEnany
Intern to Richard Ramsden
Vice President, Administration and Finance

Brown University
September 1979

PREFACE

This study is an updating of the study The Economic Impact of Brown University on the City of Providence and on the State of Rhode Island which was completed in 1976 by Carol L. Wooten and Marcia Bromberg.* The original study was intended to serve in two ways; as a general guide to the community showing the ways and the extent to which one of its major non-profit institutions contributed substantially to the regional economic base, and to reveal to the University itself how certain of its activities affect the community in direct and measurable ways. This update is intended to assess the University's current economic impact.

The update was completed during the summer of 1979. Much of the original text has been retained verbatim; current figures have been used when they were obtainable and the text has been corrected and revised where appropriate.

I would like to thank people throughout the University for their help in supplying information on the internal accounting and spending practices of the University. In particular I would like to thank Robert Reichley, Vice President for University Relations; Sallie Riggs, Assistant Vice President for University Relations; Mark Schupack, Associate Dean; Robert Riccio, Assistant Director-Finance, Physical Plant; Carol L. Wooten, Physical Planner, for her insight and direction; and Richard Ramsden, Vice President, Administration and Finance.

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* In 1976, $4,747,240 of transfer payments to banks were inadvertently included in the University expenditures figure (p. 28) $(E_R)U$ to Providence. This overstatement led to overstatement of all figures affected by $(E_R)U$. For instance:

University activities in 1975 generated about

50.6 million of additional business volume in Providence an additional $33.2 million in the remainder of the state;

36.4 million of business real estate property, equipment and inventories in Providence and an additional $18.5

million in the remainder of the State;

13.7 million of additional credit in Rhode Island banks.

University enterprises in 1975 grossed $9.5 million potentially available to local enterprises.

G.S.M.

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CHAPTER I

GENERAL APPROACH

The purpose of this study is to determine the impact of Brown University on the economic base of the community in which it exists. The University is located on a 146.8 acre campus in the City of Providence. Due to the nature of the University, its economic impact extends beyond the natural boundaries of Providence, or even the State of Rhode Island. To conduct a viable study, however, it is necessary to limit the area under consideration to that which is most profoundly affected by the activities of the University. For this reason, this study examines the University's impact on its local environment, i.e., on Providence, and on the remainder of the State of Rhode Island.

In order to study the economic impact of the University on the community, it is necessary to devise or choose a means of estimating this impact. In 1976, impact studies completed by other universities were examined, including one by Brown University in 1960.[1] Several universities had chosen a format developed by John Caffrey and Herbert H. Isaacs for the American Council on Education. Their format consists of a set of mathematical models flexible enough to be used by any size college, university, or other public or private tax-exampt institution. Additionally, the models were derived in such a way that data can be obtained primarily from the normal records kept by the institution and from public sources. The Caffrey-Isaacs models were judged to be well suited for the type of study under consideration and were chosen as a means of computing the economic impact of Brown University.

This study measures the University's impact on three major environments; business, governments, and individuals. Each environment is measured by a group of models or equations (see Figure 1). The models which are actually ordered statements of relationships among variables, further consist of submodels as depicted in Tables 1, 2, and 3.

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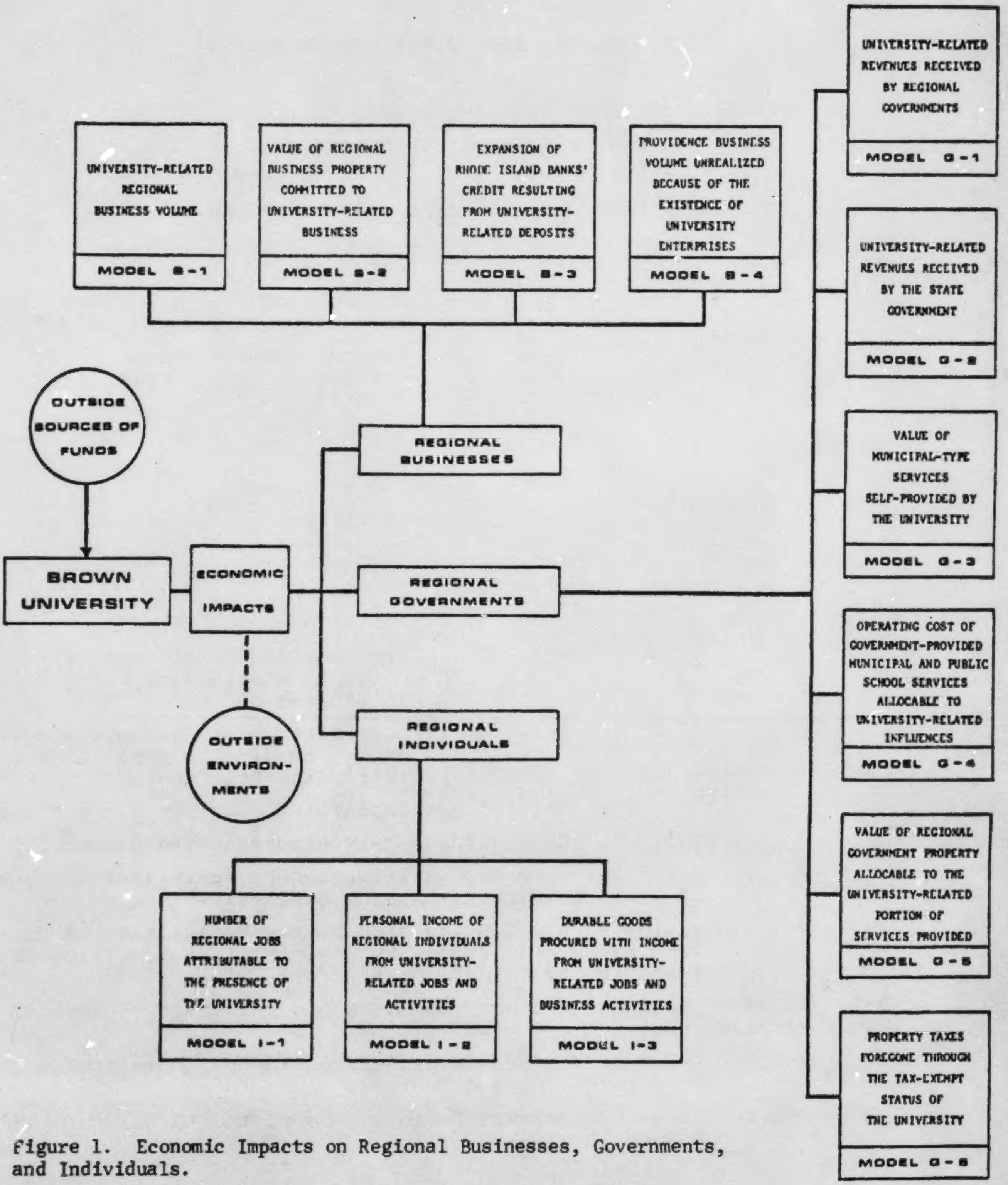
[1] The Economic Impact of Brown University on Rhode Island, Department of Economics, Brown University, April, 1960.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The economic values measured for application to the models refer to the University's campus which is located in its entirety in the City of Providence. The properties owned outside of the City are not considered in this study due to the limitations of time and resources, and because of the fact that the vast majority of University activities take place in Providence.

The data used in these models are based on 1978 internal records of the University, information gathered from a survey sent to all staff and graduate students and 50% of the undergraduate students in February 1976, adjusted by Consumer Price Indexes and from the most recent city and state documents which are available (fiscal 1978 unless otherwise specified). The time period chosen to be depicted in the results of this study is fiscal year 1978, i.e., July 1, 1977--June 30, 1978. When information for fiscal 1978 is not available, the information is based on calendar year 1978.

This study does not reflect a comprehensive in-depth picture of all economic relationships between the University and the region being studied, as practical considerations make such a goal unrealistic. It does not account for long-range effects of the University, nor does it deal to any great extent with qualitative impacts. The results provide a practical means of assessing an important segment of a varied and complex set of economic relationships.

The remaining portions of this study discuss the economic impact of the University and the techniques used in their calculation. Chapter 2 presents a general summary of the impacts found; Chapter 3, a brief discussion of hidden or qualitative benefits provided by the University. Chapter 4 provides a detailed analysis of the methods employed and the values used.

The models are not designed to present a final positive or negative impact of the University, and the major models should not be added together in an attempt to do so.

CHAPTER II

QUANTITATIVE ESTIMATES OF THE ECONOMIC IMPACT OF BROWN UNIVERSITY

A set of mathematical models is used to measure both positive and negative effects on three major sections of the City and State; business, city and state government, and private individuals.[1]

In most cases the impact on Providence is examined first, followed by the impact on Rhode Island exclusive of Providence. The results of these two operations are then summed to determine the state-wide impact. However, most of the government models contain components that vary from city to city. In such cases, figures for Rhode Island are determined by summing the data for each individual city and town in the State (excluding Providence which is calculated separately). In certain government models, five Rhode Island cities (or towns) are chosen for further examination on the basis of residency patterns of University personnel. According to the 1976 survey the town of Barrington and the cities of Cranston, East Providence, Pawtucket and Warwick, when combined with Providence, house 79% of the University's faculty and staff.

The major findings of the effort to model the above impacts of University-related expenditures and public service requirements are presented below. Although all of these impacts originate with the activities of the University, there are three basic channels through which they flow into the local area and State: 1) the

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[1] The business and individual models are based, with some modifications, on those outlined by J. Caffrey and H. Isaacs, Estimating the Impact of a College or University on the Local Economy (Washington: American Council on Education, 1971). The government models are based, with some modifications, on the Caffrey-Isaacs models and on those employed by G. Booth and J. Jarrett in The Economic Impacts of the University of Rhode Island (Kingston, 1972).

University itself acting as a corporate body; 2) the faculty and staff of the University; 3) the students. Details of each calculation and sources of data are given in Chapter 4.

Economic Impacts of Brown University on the Business Sector

The economic impacts on the business sector are discussed in four major sections:

1. University-related local and state business volume
2. Value of local and state business property committed to University-related business
3. Expansion of the state banks' credit base resulting from University-related deposits
4. Local business volume unrealized because of the existence of University-related enterprises

University-related Local and State Business Volume

Brown University is one of the largest purchasers of goods and services not only in Providence but in Rhode Island as well. Total direct and indirect expenditures in Rhode Island attributable to the University in 1978 were $103 million, of which nearly $62.5 million was spent in Providence alone. This figure can be broken down into direct and indirect expenditures as shown in Table 4.

Direct expenditures

University direct expenditures

It should be noted that the direct expenditures by the University are the value of goods and services purchased from local and state businesses. Wages and salaries are not included here, therefore, payments for Rhode Island Blue Cross and insurance are excluded as well. This shows that the Caffrey-Isaacs models will tend to understate the impact of the University, as receipts from insurance funds are not included in any other estimation, yet they may have some impact on the community.

TABLE 4

DIRECT AND INDIRECT UNIVERSITY EXPENDITURES

	In Providence	In Rhode Island Excluding Prov.
Direct Expenditures		
Expenditures by the University	$ 9,771,769	$ 2,779,672
Expenditures by the faculty and staff	14,648,467	12,081,344
Expenditures by students	7,940,450	2,594,315
Expenditures by visitors to the University	. . .	1,769,755[a]
Total	$32,360,686	$19,225,086
Indirect Expenditures		
Purchases by businesses in support of their Brown-related business volume	$ 7,442,958	$ 5,767,526
Business volume stimulated by the expenditure of University-related income by individuals other than faculty, staff and students	22,652,480	15,380,069
Total	$30,095,438	$21,147,595
Total direct and indirect expenditures	$62,456,124	$40,372,681
Total expenditures in the State	$102,828,805	

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[a] Visitor expenditures are calculated from one model for the entire state.

Faculty-staff expenditures

The dollar volume of State purchases of personal goods and services by University faculty and staff households is estimated to be $26.7 million, of which more than half is spent in Providence alone. It is interesting to note the residency patterns of University personnel established in 1976--52% live in Providence; 93% live in the State of Rhode Island. Thirty-nine percent of University personnel rent housing in the State (32% in Providence; 7% in the rest of Rhode Island), while 49% own homes in the State (24% in Providence; 25% in the rest of Rhode Island). The remainder live with parents or relatives, or live outside the State. These figures were used again in this update.

Of the more than $35.6 million disposable household income (net income after deductions of taxes, Social Security contributions, R.I. Temporary Disability Insurance) of University personnel, 41% ($14.6 million) is spent in Providence for housing and other goods and services. An additional 34% is spent outside of Providence, but in the State of Rhode Island. The breakdown of faculty and staff expenditures is shown in Table 5.

TABLE 5

FACULTY AND STAFF EXPENDITURES

	In Providence	In Rhode Island Excluding Prov.
Expenditures for rental housing	$ 2,456,660	$ 693,349
Non-housing expenditures by		
Providence personnel	9,070,837	3,259,736
Remainder of Rhode Island personnel	2,683,405	7,657,044
Non-state personnel	437,565	471,215
Total	$14,648,467	$12,081,344

Student expenditures

Full-time graduate and undergraduate students at Brown University spent an estimated $10.5 million on goods and services in the State of Rhode Island. This amount excludes housing, dining and other services purchased from the University. Their purchases were divided as shown in Table 6.

The figures given in Table 6 do not include part-time students as there is a sizable duplication in these individuals and those already accounted for in faculty-staff household counts. Student tuition and other fees are revenues to the University and are, therefore, reflected in total University expenditure figures rather than counted as direct student expenditures. As 89% of students come from out of state, this brings a sizable amount of direct expenditure into the area's economy.

TABLE 6

STUDENT EXPENDITURES

	In Providence	In Rhode Island Excluding Prov.
Miscellaneous expenditures exclusive of room and board by students living in University housing or with parents	$3,085,796	$1,352,213
Expenditures by students for rental housing	2,565,995	250,150
Non-housing expenditures by students who rent or own their home		
In Providence	2,037,057	821,772
In the remainder of Rhode Island	139,708	118,843
Non-housing expenditures by non-state students	111,894	51,697
Total	$7,940,450	$2,594,315

Visitors to the University

Visitors to the University also have a substantial impact on the State of Rhode Island. People visit the area in connection with the University for many reasons: educational visitors to participate in seminars, lecture series, colloquia, etc.; business visitors as salesmen, job-related interviewers, consultants, etc.; recreational visitors, e.g., one attending a sports event, concert, exhibit; personal visitors, e.g., parent, prospective student, alumni. When these various visitors to Brown University were totaled, it was estimated that over 66,000 visitor days could be accounted for during F.Y. 1978, producing more than $1.7 million in associated expenditures in the State directly traceable to Brown activities. It was especially difficult to estimate parental visits. In this case, only special weekend events (i.e., Freshman Parents Weekend and Parents Spring Weekend) and an estimate of freshmen who are brought to the campus by parents in the fall were used. The figure used for parental visits was most likely understated.

A summary of visitors to the University appears in Table 7. The numbers were based on direct counts of out-of-state visitors as often as possible. The total expenditures were figured for the State as it was not possible to separate out Providence expenses. Athletic expenses were quoted by the Athletic Office.

Second-round expenditures

The direct purchases of goods and services by the University, faculty, staff, students, and visitors stimulate an additional volume of local and state business activity. When the University buys supplies from a local business or a visitor eats in a local restaurant, a long train of economic transactions is set off, resulting in secondary impacts. During 1978, Providence business establishments purchased an estimated $7.4 million worth of additional or backup goods and services in the City to support University-related business transactions. For the remainder of the State, the figure was $5.8 million worth of additional goods and services purchased in the State in support of University-related business activity.

Another estimation of indirect effects of University-related business activity represents personal income-induced business activity in the area. Some of the receipts by area businessmen will be paid out to local residents in the form of wages, salaries and entrepreneurial returns, and a portion of this money will be spent for the everyday purposes of its recipients. This additional business volume stimulated by the expenditure of University-related income by area individuals amounted to $22.7 million in Providence and $15.4 million in the rest of the State in 1978.

TABLE 7

VISITOR EXPENDITURES

Type of Visitor	Room Only		Meals Only		Room & Meals		Total expenditures in Rhode Island
	# days	$ days	# days	$ days	# days	$ days	
Alumni	662	25	4400	25			126,550
Corporation	180	25	334	10			7,840
Commencement	4208	25	6808	25			275,400
Under the Elms	60	25					1,500
Parents					4313	55	237,215
Purchasing Department							
Salespeople			288	10	12	55	3,540
Physical Planning							
Consultant			30	10	10	55	850
Physical Plant			910	10			9,100
Dean's Office-interviews					25	55	1,375
Career Development							
Interviews					175	55	9,625
Libraries							
Salespeople			84	10			840
Scholars					26	55	1,430
Academic Department							
Business			465	10	174	55	14,220
Educational			1102	10	970	55	64,370
Admissions			17000	10	2500	55	307,500
Athletics			18500	35	670	30	667,600
Admin. Data Processing			40	10	7	55	785
Computer Center			286	10			2,860
Summer & Special Programs	300	25	1977	15			37,155
Total							$1,769,755

Value of Local and State Business Property Committed to University-Related Business

The capital and property related to the business activity generated by the presence of the University is contributed to by three factors:

1. Value of local and state business real estate property committed to University-related business
2. Value of local and state business inventory committed to University-related business
3. Value of state and local business property, other than real estate property and inventory (manufacturing machinery and equipment) committed to University-related business.

Our calculations show that Providence business establishments invested in an estimated $47.6 million worth of business property (real estate, inventory and equipment) in order to service University business transactions. On the State level, with Providence excluded, the University generated an additional $27.0 million in property investments by businesses located throughout the State.

Expansion of Rhode Island Banks' Credit Base Resulting from University-related Deposits

Another secondary effect of the University and its associated personnel is the expansion of the credit base of Rhode Island banks. This factor is determined by deposits, both time and demand, made by the University itself, by its faculty, staff and students, and by demand deposits of State businesses related to their University transactions. Due to the state-wide prevalence of branch banking, deposits are not retained in the community in which the bank is located; they are dispersed throughout the State by the major Rhode Island commercial banks, mutual savings banks, and savings and loan associations. Therefore, no Providence credit base creation can be meaningfully measured. We estimate that the Rhode Island credit base is augmented by $24.7 million as a direct consequence of University deposits. We have used the 1976 figures for the personal accounts of faculty, staff and students because of uncertainty about the effects of inflation. The University now holds significant deposits in State banks due to favorable competitive conditions.

Local and State Business Volume Unrealized Because of the Existence of University Enterprises

When universities engage in business activities, they are in competition with all other economic enterprises for the dollar of their constituents. The revenue that Brown University receives from the competing enterprises it operates (bookstore, rentals, student housing, dining, parking and other auxiliary activities) amounts to over $14 million. This figure must, therefore, be recognized as a net subtraction from the positive impacts on Providence business volume detailed earlier. Note that the hypothetical question of what business might spring up, or indeed if there would have been any demand for additional businesses were it not for the presence of the University, has not been considered.

Summary of the University's Impact on Local and State Business

On the basis of the estimates presented, a general summary of the effects of Brown University-related activities on the local and state business sector is as follows:

University activities in 1978 generated about

$62.4 million of additional business volume in Providence and an additional $40.4 million in the remainder of the State;

$47.6 million of business real estate property, equipment and inventories in Providence and an additional $27.0 million in the remainder of the State;

$24.7 million of additional credit in Rhode Island banks.

University enterprises in 1978 grossed $12.3 million potentially available to local enterprises.

Economic Impacts of Brown University on the Local and State Government Sector

Governmental impacts occur on two levels; those that affect the individual municipal governments and those that affect the state government. The impacts are examined in this section in the following manner:

1. University-related revenues received by local governments
2. University-related revenues received by state governments
3. Value of municipal services self-provided by the University
4. Cost of municipal services allocable to University-related influences
5. Value of local government property allocable to the University-related portion of services provided
6. Taxes foregone through the tax-exempt status of the University

University-related Revenues Received by Local Governments

Revenues received by local governments which are attributable to the presence of the University come from three main sources--real estate taxes, non-real estate property taxes, and state and federal aid and other financial reimbursements. Such revenues amount to over $2.9 million in the City of Providence and nearly $1.8 million in the other thirty-eight cities and towns in Rhode Island.

Real estate taxes

Although Brown University is itself exempt from paying real estate taxes, it is responsible for real estate taxes paid to local governments as shown in Table 8.

TABLE 8

UNIVERSITY-RELATED REAL ESTATE TAXES

	In Providence	In Rhode Island Excluding Prov.
Farview, Inc.	$ 37,181	$ . . .
Faculty and Staff	227,899	474,902
Business for real estate property allocable to University-related business	1,424,712	531,829
Total real estate taxes paid	$1,689,792	$1,006,731

Farview, Inc. was created in 1958 by the University as a real estate holding company to maintain certain University properties on the City of Providence tax rolls. These properties are both residential and business rentals.

As noted earlier, 52% of Brown personnel live in the City of Providence while an additional 41% live in other cities and towns throughout the State. Of those persons living in Providence, 40% own their own homes and contribute to the real estate tax rolls. This proportion is even higher for those employees residing in Rhode Island outside of Providence where 71% are home owners. Over 0.7 million dollars in local revenues can be directly attributed to the University through real estate taxes.

Just as certain business real property is committed to University-related business, a portion of the real estate taxes paid by business establishments is allocable to Brown-related transactions. Thus, in a more indirect manner, the presence of the University accounts for another $1.96 million in local revenues.

Non-real property taxes

Non-real property taxes are separated into three categories. These categories and the University's impact on each are shown in Table 9. Of the non-real property taxes itemized in Table 9, only motor vehicle taxes are directly affected by the University. Although Brown vehicles are tax-exempt, faculty, staff and students are responsible for over $300,000 in motor vehicle tax payments throughout the State.

TABLE 9

UNIVERSITY-RELATED NON-REAL PROPERTY TAXES

	In Providence	In Rhode Island Excluding Prov.
Motor vehicle taxes	$171,060	$143,938
Manufacturers' machinery and equipment taxes	128,351	49,024
Tangible and personal property taxes	612,393	246,726
Total	$911,804	$439,688

Revenues received from manufacturers' machinery taxes are only affected by the University in the sense that the business volume attributable to the University generates a certain percentage of the taxes collected. This also holds true for tangible and personal property tax revenues. However, a minor portion of this last non-real property tax comes from persons associated with the University through ownership of boats, mobile homes and the like. Therefore, the University impact is understated to some extent. More than $970,000 in tax revenues is generated by the University in this manner.

State and federal aid and other financial reimbursements

Local governments receive revenues from the state and federal government in the form of aid and grants based on several criteria, certain of which are affected by the presence of the University. Table 10 demonstrates the relationship between these municipal revenues and the University.

TABLE 10

STATE AND FEDERAL AID AND REIMBURSEMENTS

	In Providence	In Rhode Island Excluding Prov.
Aid based on population	$ 27,423	$ 3,322
Aid based on property taxes	28,011	15,911
Aid to education	286,069	320,872
Total	$341,503	$340,105

University-Related Revenues Received by the State Government

Taxes collected by the State are classed as population taxes, income taxes, and business taxes. Population taxes include, among others, gasoline tax, cigarette tax and sales tax. Such taxes are regressive in nature and the burden falls on all persons equally. Therefore, population is used as a basis for calculating the portion of these taxes allocable to the University. Conversely, income taxes are progressive and the portion allocable to the University is a function of personal income levels rather than population. Business taxes are not directly affected by the University; however, as mentioned earlier, the University is responsible for generating a certain amount of business in the State and is, therefore, indirectly responsible for a similar portion of the taxes collected from businesses. In all, the University is responsible for over $6.0 million in taxes paid to the state government. It should be noted that all taxes related to horse racing are excluded from this section, following the assumption that the presence of the University has no effect on the horse racing business nor on the taxes collected from it.

Value of Municipal Services Self-provided by the University

The University supplies certain municipal-type services for itself that would otherwise have to be provided by the City of Providence. These services consist of garbage removal and security services, and amount to an annual value of over $600,000.

Value of Municipal Services Allocable to University-related Influences

Although Brown University provides certain municipal services for itself, it is still accountable for other services provided for faculty, staff and students. The value of such services comes to more than $1.1 million in Rhode Island excluding Providence, and more than $1.5 million locally.

For allocation purposes, the cost of services has been divided into cost for municipal services--$899,000 throughout the State, and public school costs--$1.7 million statewide. The first figure represents a per resident expenditure by municipalities; the second a per student expenditure by municipal school districts. It is estimated that persons associated with the University have 484 children in the Providence public school system and 554 children in other public schools throughout Rhode Island.

Value of Local Government Property Allocable to the University-related Portion of Services Provided

In allocating municipal and public school service expenditures, one must further look to the government-owned capital facilities that exist to support such services. If a portion of the services provided are attributable to the presence of the University, a portion of the capital costs must also be affected by that presence. Using the proportion of municipal services allocable to the University as a guide, it is estimated that the City of Providence commits almost $2.5 million of its property to the support of services for University-related persons. In other cities and towns throughout the state, the amount is over $1.3 million.

Property Taxes Foregone Through the Tax-exempt Status of the University

One of the most controversial factors concerning the presence of the University in the community is its tax-exempt status. As mentioned earlier, Farview, Inc. does pay taxes on certain University-owned property. However, the University does not pay taxes on the vast majority of its properties, and in this sense represents a loss of revenue to the City of Providence of over $710,000. This figure is based on the assumption that the assessed value of the University's land would be similar to that of other land within the City.

Another loss of revenue to cities in the region, which is included in the above-mentioned figure, is the $10,000 or less personal property tax exemption available to Brown University professors. This exemption is available throughout the State to persons who became professors prior to July 1, 1966 and represents a total loss of $12,400 in municipal revenues (excluding Providence).

Summary of the University's Impact on Local and State Government

A general summary of the above figures indicates that Brown University contributes $2.9 million in revenues to the City of Providence, $1.8 million to the other thirty-eight cities and towns in Rhode Island, and $6.0 million to the State government. These revenues are generated directly and indirectly by the presence of the University. Conversely, the University can be said to cost the City of Providence $4.7 million in services provided and loss of income. The similar figure for the rest of the State is $2.5 million.

It would be easy at this point to balance revenues against expenditures to see if the governmental units involved are coming out ahead or coming up short. One must keep in mind, however, that a simple balance sheet such as this does not take into account the many important, unmeasurable and intangible factors that are beyond quantitative analysis.

Economic Impacts of Brown University on State and Local Individuals

The individual is the third sector in the state and local area influenced by the presence of Brown University. There are three major ways that this influence is felt: through jobs and employment opportunities created; through the personal income of individuals from University-related jobs and business activities; and through durable goods procured with income from University-related jobs and business activities.

An estimated 4,940 jobs in Providence and an additional 1,423 jobs in the remainder of the State are produced by the activities of the University. Out of this number 2,229 persons are directly employed by Brown and 4,134 jobs are created as a consequence of University expenditures and non-University government expenditures (municipal and public school services) caused by the presence of the University.

When compared to regional businesses and industries, Brown is shown to be one of the largest employers. For instance, it employs more people than all department stores in Providence, and more than all variety stores, grocery stores or women's ready-to-wear stores in the City. It is also responsible for more jobs than any of the State's largest manufacturing firms--B.I.F. Industries, Inc., Bulova Watch Company, Coro Inc., Davol Inc., General Electric Co., Gorham Corporation, Grinnell Corporation, or Speidel, for example.

The jobs created directly and indirectly by the University generate a total personal income of $31.8 million to individuals employed in Providence, and an additional $19.7 million to those employed elsewhere in the State. Of these amounts, an estimated $4.4 million is spent by these individuals for durable goods.

CHAPTER III

DESCRIPTIONS OF THE MODELS, ESTIMATING PROCEDURES AND DATA SOURCES EMPLOYED

Chapter 2 provides a summary of the economic impacts of Brown University on the local and state economies. As mentioned previously, a set of mathematical models are used to provide this measure of the University's impact. The models are largely based on simple linear cash-flow formulas designed by Caffrey and Isaacs (1971) to estimate the impacts of a college on its local environment. As the geographic environment selected for this study is broader than just the local area, we have expanded their approach by use of simple modifications similar to those employed by Booth and Jarrett (1972) in their economic impact study of the University of Rhode Island.

The Caffrey and Isaacs models are designed to assess the impacts on three sectors of the economy--business, government, and individuals. The nomenclature for these models is designed to provide a consistent numbering framework to relate the various models and submodels. A model which serves to estimate an impact on the business sector is identified as a B-model, government as a G-model, and individual as an I-model. An example of the numbering system is as follows: the business models consist of four major groups--B-1, B-2, B-3, and B-4. These major models are further broken down into submodels, e.g., Model B-1 is composed of components B-1.1, B-1.2 and B-1.3; B-1.1 is subdived further into B-1.1.1, B-1.1.2, etc. Each model is, therefore, described in terms of its components and their relationship to one another. The data are then aggregated to provide the results at the highest level of summation. Each major model, however, expresses a separate impact so the end result of these models cannot be added together. Figure 1 (see Chapter 1) represents the economic relationship between the University and the three major sectors of the area's economy including the composition of each sector. Tables 1--3 summarize the major components of these models.

Each model is an ordered statement of relationship among variables expressed as equations. There are two types of models in this study. Definition models involve simple accounting, e.g., $Y = C + I$ (income = consumption + investment). The second type of model describes a functional relationship, e.g., $C = a + bY$ (consumption is a linear function of income).

The notation scheme used in the models has been adapted from Caffrey and Isaacs. Total amounts are represented with capital letters, e.g.,

P = purchases
UR = University-related
E = expenditures

Coefficients (fractional multipliers) are represented with lowercase letters, e.g.,

f_H= fractional multiplier (proportion) of faculty and staff who rent housing
e_H= proportion of a tenant's total expenditures likely to be spent for rental housing

Indexes or simple proportions are represented by lower case mnemonics, e.g.,

amv = ratio of assessed to market value of real taxable property
cbv = cash-to-business-volume ratio.

In most cases, each model and submodel are calculated twice--once for Providence, and again for the remainder of Rhode Island. In order to simplify presentation of the models, each model is written once. A calculation relating to Providence is followed by one relating to the remainder of the State. In the descriptions of the variables, Providence and the remainder of Rhode Island are referred to as "the region" to avoid repetition.

Each model and submodel is presented with a detailed discussion which includes an evaluation of the estimating procedures, data sources, and computations.

Business Models

University-Related Regional Business Volume

Model B-1 and its component submodels accumulate the following values: direct purchases from regional businesses made by the University, its faculty, staff, students and visitors (B-1.1); purchases from regional sources by regional businesses in support of their University-related business volume, or "second-round" purchases (B-1.2); and the amount of regional business volume stimulated by the expenditure of University-related income by individuals other than faculty, staff and students (B-1.3).

* * * * * * * * * * *

Model B-1

BV_{UR}

University-Related Regional Business Volume

$$BV_{UR} = (E_R)_{UR} + (P_{RB})_{UR} + (BV_I)_{UR}$$

Providence:

$BV_{UR} = \$32,360,686 + \$7,442,958 + \$22,652,480$

$BV_{UR} = \$62,456,124$

Rhode Island excluding Providence

$BV_{UR} = \$19,225,086 + \$5,767,526 + \$15,380,069$

$BV_{UR} = \$40,372,681$

Variable Description:

$(E_R)_{UR}$ = University-related regional expenditures (Model B-1.1)

$(P_{RB})_{UR}$ = purchases from regional sources by businesses in support of their University-related business volume (Model B-1.2)

$(BV_I)_{UR}$ = regional business volume stimulated by the expenditure of University-related income by individuals other than faculty, staff, or students (Model B-1.3)

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Regional expenditures directly related to the activities of Brown University

Model B-1.1 is the dollar value of University-related regional direct expenditures. Included in this model is the sum of expenditures by the University (B-1.1.1), by faculty and staff (B-1.1.2), by students (B-1.1.3), and by visitors to the University (B-1.1.4). This model again simply accumulates the results of its submodels. Expenditures by visitors are calculated for the State only.

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Model B-1.1

$(E_R)_{UR}$

University-Related Regional Expenditures

$$(E_R)_{UR} = (E_R)_U + (E_R)_F + (E_R)_S + (E_R)_V$$

Providence:

$$(E_R)_{UR} = \$9,771,769 + \$14,648,467 + \$7,940,450$$

$$(E_R)_{UR} = \$32,360,686$$

Rhode Island excluding Providence:

$$(E_R)_{UR} = \$2,779,672 + \$12,081,344 + \$2,594,315 + \$1,769,755$$

$$(E_R)_{UR} = \$19,225,086$$

Variable Description:

$(E_R)_U$ = regional expenditures by the University (Model B-1.1.1)

$(E_R)_F$ = regional expenditures by faculty and staff (Model B-1.1.2)

$(E_R)_S$ = regional expenditures by students (Model B-1.1.3)

$(E_R)_V$ = regional expenditures by visitors to the University (Model B-1.1.4)

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University expenditures

The value of purchases of goods and services by the University from regional businesses was obtained directly from a computer listing provided by our Purchasing Department for the calendar year 1978. Wages and salaries are not included here, nor are internal departmental transfers or taxes. Payments to banks have been eliminated because the bulk of such payments are transfer payments. The model is understated by the amount paid to banks for services.

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Model B-1.1.1

$(E_R)_U$

University Expenditures

Providence:

$(E_R)_U = \$9,771,769$

Rhode Island excluding Providence:

$(E_R(_U = \$2,779,672$

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Faculty and staff expenditures

Model B-1.1.2 estimates the dollar volume of regional purchases of personal goods and services by the University's faculty and staff households. These purchases are made by three groups: those residing in Providence; those residing in the remainder of Rhode Island; those living out-of-state. Both rental housing and non-housing expenditures are considered for those who rent apartments or houses in the State, while only non-housing expenditures are considered for out-of-staters.

Understatement is apparent in this model as it does not consider payments to real estate brokers, or payment of interest charges on mortgages to local banks.

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Model B-1.1.2

$(E_R)_F$

Faculty and Staff Expenditures

$$(E_R)_F = (E_H)_F + (E_{NH})_{PF} + (E_{NH})_{RIF} + (E_{NH})\ NSF$$

Providence:

$(E_R)_F$ = \$2,456,660 + \$9,070,837 + \$2,683,405 + \$437,565

$(E_R)_F$ = \$14,648,467

Rhode Island excluding Providence:

$(E_R)_F$ = \$693,349 + \$3,259,736 + \$7,657,044 + \$471,215

$(E_R)_F$ = \$12,081,344

Variable Description:

$(E_H)_F$ = expenditures by faculty and staff for regional rental housing (Model B-1.1.2.1)

$(E_{NH})_{PF}$ = regional non-housing expenditures by Providence faculty and staff (Model B-1.1.2.2)

$(E_{NH})_{RIF}$ = regional non-housing expenditures by Rhode Island (excluding Providence) faculty and staff (Model B-1.1.2.3)

$(E_{NH})_{NSF}$ = regional non-housing expenditures by non-state faculty and staff (Model B-1.1.2.4)

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Model B-1.1.2.1 considers the annual housing expense of those who rent housing in the State of Rhode Island. Those who own their own homes are considered later as a part of the value of regional real estate property related to the University. In 1976 the relative proportions of personnel residing in Providence and those in the remainder of the State were derived from a computer printout supplied by the Personnel Office. Those proportions were used in this update. The other components used in this model are based on information supplied by the 1976 faculty and staff questionnaires.

All figures contained in this model are stratified into three employee groups (weekly-paid, non-appointed, and appointed), and then summed across employee categories. Subdividing employees in this manner provided a more accurate assessment of spending habits, as the survey results showed marked mean variations in disposable income, in the proportions residing in local and state areas, and in the proportion who rent.

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Model B-1.1.2.1

$(E_H)_F$

Expenditures by Faculty and Staff for Regional Rental Housing

$$(E_H)_F = \mathop{}\limits_{i=1}^{3} (E_H)_{Fi} = \mathop{}\limits_{i=1}^{3} (f_{Ri})\ (f_{Hi})\ (DI_{fi})\ (e_{Hi})$$

Providence:

$$(E_H)_F = \mathop{}\limits_{i=1}^{3} (E_H)_{Fi} = \$305{,}907 + \$801{,}179 + \$1{,}349{,}574$$

$$(E_H)_F = \$2{,}456{,}660$$

Rhode Island excluding Providence:

$$(E_H)_F = \mathop{}\limits_{i=1}^{3} (E_H)_{Fi} = \$139{,}880 + \$374{,}111 + \$179{,}358$$

$$(E_H)_F = \$693{,}349$$

i = 1 - weekly-paid employees
1 = 2 = non-appointed employees
i = 3 = appointed employees

Variable Description (See Appendix B, Tables 13 through 16 for values and computational details):

f_{Ri} = proportion of faculty and staff residing in the region
F_{Hi} = proportion of regional faculty and staff who rent housing
DI_{Fi} = total disposable household income of faculty and staff
e_{Hi} = proportion of a tenant's total expenditures spent for rental housing

(Note: each of the above variables is in the i^{th} employee category)

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Models B-1.1.2.2 through B-1.1.2.4 estimate the amount of money University faculty and staff annually spend in the region for purchases of goods and services. Purchases in Providence are made by those who reside locally as well as those living outside the city. In the same vein, those living in Providence spend money in the rest of Rhode Island. Out-of-staters working at Brown will spend money in both the local area and the State. These models, which estimate non-housing expenditures in the region, are differentiated by area of residence, as that is an important factor in determining where most expenditures are made. Again, as in the previous model, personnel have been stratified into employee groups to provide a more accurate estimate of expenditures.

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Model B-1.1.2.2

$(E_{NH})_{PF}$

Regional Non-Housing Expenditures by Faculty and Staff Residing in Providence

$$(E_{NH})_{PF} = \sum_{i=1}^{3} (E_{NH})_{PFi} = \sum_{i=I}^{3} (DI_{PFi})(e_{NH})_{PFi}$$

Providence:

$$(E_{NH})_{PF} = \sum_{i=1}^{3} (E_{NH})_{PFi} = \$719,859 + \$1,666,560 + \$6,684,402$$

$$(E_{NH})_{PF} = \$9,070,837$$

Rhode Island excluding Providence:

$$(E_{NH})_{PF} = \sum_{i=1}^{3} (E_{NH})_{PFi} = \$611,226 + \$692, 480 + \$1,956,030$$

$$(E_{NH})_{PF} = \$3,259,736$$

$i = 1, 2, 3$ employee categories

Variable Description (See Appendix B, Table 17 for values and computational details):

DI_{PFi} = total disposable household income of faculty and staff residing in Providence

$(e_{NH})_{PFi}$ = proportion of Providence faculty and staff income spent in the region on non-housing items

(Note: each of the above variables is in the i^{th} employee category)

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Model B-1.1.2.3

$(E_{NH})_{RIF}$

Regional Non-Housing Expenditures by Faculty and Staff Residing in Rhode Island (excluding Providence)

$$(E_{NH})_{RIF} = \underset{i=1}{\overset{3}{}} (E_{NH})_{RIFi} = \underset{i=1}{\overset{3}{}} (DI_{RIFi})(e_{NH})_{RIFi}$$

Providence:

$$(E_{NH})_{RIF} = \underset{i=1}{\overset{3}{}} (E_{NH})_{RIFi} = \$460{,}348 + \$897{,}369 + \$1{,}325{,}688$$

$$(E_{NH})_{RIF} = \$2{,}683{,}405$$

Rhode Island excluding Providence:

$$(E_{NH})_{RIF} = \underset{i=1}{\overset{3}{}} (E_{NH})_{RIFi} = \$1{,}211{,}304 + \$3{,}065{,}532 + \$3{,}380{,}208$$

$$(E_{NH})_{RIF} = \$7{,}657{,}044$$

Variable Description (see Appendix B, Table 17 for values and computational details):

DI_{RIFi} = total disposable household income of faculty and staff residing in Rhode Island (excluding Providence)

$(e_{NH})_{RIFi}$ = proportion of Rhode Island (excluding Providence) faculty and staff income spent in the region on non-housing items

(Note: each of the above variables is in the i^{th} employee category)

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Model B-1.1.2.4

$(E_{NH})_{NSF}$

Regional Non-Housing Expenditures by Faculty and Staff Residing Outside the State

$$(E_{NH})_{NSF} = \sum_{i=1}^{3} (E_{NH})_{NSFi} = \sum_{i=1}^{3} (DI_{NSFi})(e_{NH})_{NSFi}$$

Providence:

$$(E_{NH})_{NSF} = \sum_{i=1}^{3} (E_{NH})_{NSFi} = \$64,464 + \$173,385 + \$199,716$$

$$(E_{NH})_{NSF} = \$437,565$$

Rhode Island excluding Providence:

$$(E_{NH})_{NSF} = \sum_{i=1}^{3} (E_{NH})_{NSFi} = \$95,832 + \$154,485 + \$220,898$$

$$(E_{NH})_{NSF} = \$471,215$$

Variable Description (see Appendix B, Table 17 for values and computational details):

DI_{NSFi} = total disposable household income of faculty and staff residing out-of-state

$(e_{NH})_{NSFi}$ = proportion of non-state faculty and staff's income spent in the region

(Note: each of the above variables is in the i^{th} employee category)

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Student expenditures

In considering student expenditures, a categorization by groups provides a more accurate assessment of their spending habits. Therefore, undergraduates are treated separately from graduate students, and then the two are totaled. The expenditures of undergraduates are based on a nine month (2 semester) period as the majority of these students do not remain in the area during the summer. Graduate students, on the other hand, are assumed to spend the entire year in the region. Within these two groups, students are further subdivided into four categories on the basis of housing arrangements.

The first category includes students who live in University housing (e.g., dormitories, fraternities, co-ops, etc.) or live at home with parents or relatives. These students are similar in that they do not rent or own housing in the community. The majority of those living in University housing purchase some kind of meal contract from the University dining facilities (around 70%).

The remaining categories of students are similar to the groups established when compiling faculty and staff expenditures, i.e., students who rent or own housing in Providence (non-University owned), in the remainder of the State, and outside the State.

Model B-1.1.3 accumulates five terms to estimate housing and non-housing expenditures made in the region.

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Model B-1.1.3

$(E_R)_S$

Student Expenditures

$$(E_R)_S = (E_M)_S + (E_H)_S + (E_{NH})_{PS} + (E_{NH})_{RIS} + (E_{NH})_{NSS}$$

Providence:

$$(E_R)_S = \$3,085,796 + \$2,565,995 + \$2,037,057 + \$139,708 + \$111,894$$

$$(E_R)_S = \$7,940,450$$

Rhode Island excluding Providence:

$$(E_R)_S = \$1,352,213 + \$250,150 + \$821,772 + \$118,483 + \$51,697$$

$$(E_R)_S = \$2,594,315$$

Variable Description:

$(E_M)_S$ = miscellaneous expenditures in the region made by students living in University housing or with parents (Model B-1.1.3.1)

$(E_H)_S$ = expenditures by students for regional rental housing (Model B-1.1.3.2)

$(E_{NH})_{PS}$ = regional non-housing expenditures by students who rent or own housing in Providence (Model B-1.1.3.3)

$(E_{NH})_{RIS}$ = regional non-housing expenditures by students who rent or own housing in Rhode Island (excluding Providence) (Model B-1.1.3.4)

$(E_{NH})_{NSS}$ = regional non-housing expenditures by students who rent or own housing out-of-state (Model B-1.1.3.5)

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Model B-1.1.3.1 estimates the expenditures, exclusive of room and board, by students living in University housing or in parental quarters. To obtain this figure, the number of such students is multiplied by the average miscellaneous expenditures per student of this type. The result is then multiplied by the proportion of total expenditures, exclusive of room and board, spent in the region. The number of students in this group is based on the results of the student survey. Their average expenditures are computed by summing their total expenditures across classes (i.e., freshman, sophomore, etc.), then dividing by the total number of students in this group (see Appendix B, Table 20). The proportion of total non-University expenditures that a student makes in the region was again calculated from information obtained from the survey. Expenditures were summed across classes, then divided by the sample size to find the proportion (see Appendix B, Table 21). The 1979 figures are based on adjustments made to the 1976 figures using the Consumer Price Index and relevant information about student residency patterns obtained from the Housing Office and the 1977-78 Student Directory.

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Model B-1.1.3.1

$(E_M)_S$

Regional Miscellaneous Non-University Expenditures by Students Living in University Housing or with Parents

$$(E_M)_S = \mathop{}\limits_{i=1}^{2} (E_M)_{Si} = \mathop{}\limits_{i=1}^{2} (S_{UH,Pi})(E_m)_{Si}(e_R)_{Si}$$

Providence:

$$(E_M)_S = {}_{i=1}^{2}(E_M)_{Si} = \$429,162 + \$2,656,634$$

$$(E_M)_S = \$3,085,796$$

Rhode Island excluding Providence:

$$(E_M)_S = {}_{i=1}^{2}(E_M)_{Si} = \$168,840 + \$1,183,373$$

$$(E_M)_S = \$1,352,213$$

$i = 1$ = graduate students

$i = 2$ = undergraduate students

Variable description (see Appendix B, Tables 19 through 21 for values and computational details):

$S_{UH,Pi}$ = number of students living in University housing or with parents

$(E_m)_{Si}$ = average miscellaneous expenditures (non-University) per student of this type

$(e_R)_{Si}$ = proportion of total expenditures, exclusive of room and board, that a student is likely to make in the region

(Note: each of the above variables is in the i^{th} category)

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Expenditures by students for rent in the City and the remainder of the State are estimated in Model B-1.1.3.2. The regional non-housing expenditures by the students who rent or own housing in Providence are depicted in Model B-1.1.3.3, and by those in the remainder of the State in Model B-1.1.3.4. These models, as in the previous student models, depend heavily on information gathered in the survey in 1976, and adjusted by the Consumer Price Index and available information from the Housing Office and the Student Directory in 1979.

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Model B-1.1.3.2

$(E_H)_S$

Expenditures by Students for Regional Rental Housing

$$(E_H)_S = \sum_{i=1}^{2} (E_H)_{Si} = \sum_{i=1}^{2} (S_{Hi})(E_h)_{Si}$$

Providence:

$$(E_H)_S = \sum_{i=1}^{2} (E_H)_{Si} = \$1,852,700 + \$713,295$$

$$(E_H)_S = \$2,565,995$$

Rhode Island excluding Providence:

$$(E_H)_S = \sum_{i=1}^{2} (E_H)_{Si} = \$220,675 + \$29,475$$

$$(E_H)_S = \$250,150$$

$i = 1$ = graduate students

$i = 2$ = undergraduate students

Variable Description (see Appendix B, Table 21 for values):

S_{Hi} = number of students renting housing in the region

$(E_h)_{Si}$ = average rental housing expenditures per student

(Note: each of the above variables is in the i^{th} student category)

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Model B-1.1.3.3

$(E_{NH})_{PS}$

Non-Housing Expenditures by Students who Own or Rent Housing in Providence

$$(E_{NH})_{PS} = \sum_{i=1}^{2} (E_{NH})_{PSi} = \sum_{i=1}^{2} (S_{Pi})(E_{nh})_{Si}(e_R)_{Si}$$

Providence:

$$(E_{NH})_{PS} = \sum_{i=1}^{2} (E_{NH})_{PSi} = \$1,645,782 + \$391,275$$

$$(E_{NH})_{PS} = \$2,037,057$$

Rhode Island excluding Providence:

$$(E_{NH})_{PS} = \overset{2}{\underset{i=1}{}} (E_{NH})_{PSi} = \$647,482 + \$174,290$$

$$(E_{NH})_{PS} = \$821,772$$

$i = 1$ = graduate students

$i = 2$ = undergraduate students

Variable Description (see Appendix B, Tables 19 and 21 for values and computational details):

S_{Pi} = number of students who rent or own housing in Providence

$(E_{nh})_{Si}$ = average non-housing expenditure per student

$(e_R)_{Si}$ = proportion of total expenditures, exclusive of room and board, that a student is likely to make in the region

(Note: each of the above variables is in the i^{th} student category)

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Model B-1.1.3.4 estimates the local and state expenditures of students who rent or own housing in cities and towns in Rhode Island, outside of Providence. Model B-1.1.3.5 estimates the same expenditures for students who live outside the State. As so few undergraduates live outside the City of Providence, an average expenditure for the combined group of students (non-Providence and non-State) is used in both models to estimate local expenditures. To estimate State expenditures by students owning or renting housing in Rhode Island, excluding Providence, the average non-housing expenditure per student is multiplied by the proportion of non-housing expenditures that a student is likely to make in Rhode Island (excluding Providence) as was done in Model B-1.1.3.3. State expenditures by non-state students were estimated from average expenditures in Rhode Island, excluding Providence. 1979 figures are based on the information gathered in 1976 and updated by using the Consumer Price Index.

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Model B-1.1.3.4

$(E_{NH})_{RIS}$

Regional Expenditures by Rhode Island (excluding Providence) Students

Providence:

$$(E_{NH})_{RIS} = \overset{2}{\underset{i=1}{}} (E_{NH})_{RISi} = (S_{RIi})(E_r)_{NLSi}$$

$$(E_{NH})_{RIS} = \overset{2}{\underset{i=1}{}} (E_{NH})_{RISi} = \$121,828 + \$17,880$$

$$(E_{NH})_{RIS} = \$139,708$$

Rhode Island excluding Providence:

$$(E_{NH})_{RIS} = \overset{2}{\underset{i=1}{}} (E_{NH})_{RISi} = (S_{RIi})(E_{nh})_{Si}(e_R)_{Si}$$

$$(E_{NH})_{RIS} = \overset{2}{\underset{i=1}{}} (E_R)_{RISi} = \$109,981 + \$8,502$$

$$(E_{NH})_{RIS} = \$118,483$$

i = 1 = graduate students

i = 2 = undergraduate students

Variable Description (see Appendix B, Tables 21 and 22 for values and computational details):

SRIi = number of students who rent or own housing in Rhode Island excluding Providence

$(E_r)_{NLSi}$ = average expenditures in the region by non-local students

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$(E_{nh})_{Si}$ = average non-housing expenditure per student

$(e_R)_{Si}$ = proportion of total expenditures, exclusive of room and board, that a student is likely to make in the region

(Note: each of the above variables is in the i^{th} student category)

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Model B-1.1.3.5

$(E_{NH})_{NSS}$

Regional Expenditures by Non-State Students

$$(E_{NH})_{NSS} = \mathop{}\limits_{i=1}^{2} (E_{NH})_{NSSi} = \mathop{}\limits_{i=1}^{2} (S_{NSi})(E_r)_{NSSi}$$

Providence:

$$(E_{NH})_{NSS} = \mathop{}\limits_{i=1}^{2} (E_{NH})_{NSSi} = \$109,004 + \$2,980$$

$$(E_{NH})_{NSS} = \$111,984$$

Rhode Island excluding Providence:

$$(E_{NH})_{NSS} = \mathop{}\limits_{i=1}^{2} (E_{NH})_{NSSi} = \$50,337 + \$1,360$$

$$(E_{NH})_{NSS} = \$51,697$$

$i = 1$ = graduate students
$i = 2$ = undergraduate students

Variable Description (see Appendix B, Table 22 for values and computational details):

S_{NSi} = number of students who rent or own housing out-of-state
$(E_r)_{NSSi}$ = estimated average expenditures in the region by non-state students

(Note: each of the above variables is in the i^{th} student category)

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Visitor expenditures

A group more diverse than students of the University are its visitors. To facilitate collection of data on visitors, they were divided into four main categories. Business visitors such as book and equipment salesmen, foundation representatives, job interviewers, consultants, etc., were collected from academic departments, the

Physical Plant office, Purchasing Department, Deans' Office, Career Development Office, and the libraries. Recreational visitors such as sports spectators and special events attendees were collected from the Athletic Department and various Alumni offices. Educational visitors, such as conference attendees or seminar participants, were collected from academic departments. Personal visitors such as parents, prospective students and alumni, were collected from the Alumni and University Relations offices and the Admission Office.

Certain assumptions were made in totaling the number of visitor days. To qualify as a visitor, only those persons who would have spent nothing in the region had it not been for the presence of the University are counted. Hence, a visitor for committee business or other reasons, having a Rhode Island address, is not counted. Brown hosts many summer and special programs. The visitors who stayed in University housing and dined only in campus eateries are not counted. Some educational visitors such as colloquia speakers and guest lecturers, whose expenses are paid by the University, are also not counted as their expenditures have already been covered by the model which estimates the University's expenditures in the region (Model B-1.1.1). Visitors who stayed in University housing with no meals included are counted as day visitors, as were salespeople.

As approximately 89% of the University's undergraduate student body came from out of state, the projections on parental visits are based on this figure. In the estimate on parental visits, only special weekend events, such as Parents' Weekend and Parents' Spring Weekend, were counted and added to an 89% estimate of the number of parents arriving in the fall to drop off freshmen for the first time. Obviously, this figure is underestimated as parents are likely to visit at more frequent intervals than assumed above.

From the data collected from the various departments mentioned above, 17 visitor categories were itemized by three different types of stays--room only (meals provided by the University), day visitors (meals only), and overnight visitors (room and meals).

Estimated expenditures for the cost of an overnight room are based on the average cost per person among 14 hotels and motels in the area.

It was not possible to separate expenditures made in Providence from those made in the remainder of the State. Therefore, Model B-1.1.4 has been calculated once to represent visitor expenditures in the entire State. An itemized list of the types of visitors and their expenditures is found in Chapter 2.

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Model B-1.1.4

$(E_R)_V$

Expenditures in Rhode Island by Visitors to the University

$$(E_R)_V = \mathop{}_{j=1}^{3}\ \mathop{}_{i=1}^{13} (E_R)_{Vij} = \mathop{}_{j=1}^{3}\ \mathop{}_{i=1}^{13} (V_{ij})(E_{ij})$$

$$(E_R)_V = \mathop{}_{j=1}^{3}\ \mathop{}_{i=1}^{13} (E_R)_{Vij} = \$1,769,755$$

$j = 1$ = visitors obtaining a room only in Rhode Island

$j = 2$ = visitors obtaining meals only in Rhode Island

$j = 3$ = visitors obtaining room and meals in Rhode Island

$i = 1, 2 \ldots, 13$ = visitor categories (see Chapter 2, p. 12)

Variable Description:

V_{ij} = estimated number of visitor days at the University by visitors in the i^{th} visitor category in the j^{th} expenditure type

E_{ij} = estimated Rhode Island expenditures by each visitor in the i^{th} visitor category in the j^{th} expenditure type during each visit to the University

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Regional expenditures indirectly related to the activities of Brown University

Any purchase made by the University or its faculty, staff, students or visitors will set off a long train of economic transactions. The initial dollar will be respent many times and may reappear as income to residents of the community, as business receipts by other regional merchants, or as payment to suppliers outside the community. Thus, this initial dollar has stimulated additional expenditure through the respending of a diminishing proportion of the original expenditure. This process is usually referred to as the multiplier effect. As a general rule, the more self-contained the local or regional economy, the larger the multiplier response.

Providence is a medium-sized city (population 179,000) with a diversified and well-developed economic base with strong trade ties to the remainder of the State, especially its surrounding cities of Cranston, Pawtucket and Warwick. Therefore, the multipliers used in estimating Providence's economic relationships are medium values. However, Rhode Island has a much more diverse economic base, so the multiplier for the State is a much larger value. A discussion of the multipliers used in this study and the values chosen is found in Appendix C.

Models B-1.2 and B-1.3 estimate the additional volume of local and state business activity which results from the purchase of goods and services considered in the other B-1 models. Model B-1.2 is an estimate of the volume of purchases by regional concerns in support of their University-related business. The multiplier m_p represents the proportion of receipts from University-related purchases used in turn to purchase goods and services from regional sources.

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Model B-1.2

$(P_{RB})_{UR}$

Purchases from Regional Sources by Businesses in Support of
Their University-Related Business Volume

$$(P_{RB})_{UR} = (m_p)(E_R)_{UR}$$

Providence:

$(P_{RB})_{UR}$ = (0.23)($32,360,686)

$(P_{RB})_{UR}$ = $7,442,958

Rhode Island excluding Providence:

$(P_{RB})_{UR}$ = (0.30)($19,225,086)

$(P_{RB})_{UR}$ = $5,767,526

Variable Description:

m_p = coefficient representing the degree to which regional businesses purchase goods and services from regional sources (see Appendix C)

$(E_R)_{UR}$ = University-related regional expenditures (Model B-1.1)

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Model B-1.3, the second estimation of indirect effects of University-related business activity, represents the dollar volume of regional business activity that is induced by individuals' expenditure of income derived from previous regional purchases. For example, some of the receipts of area businesses will be paid to residents of the region in the form of wages and salaries; part of this income will again be respent in the region by its recipients for everyday purposes. The multiplier m_i used in Model B-1.3 represents the proportion of income received from University-related business activity that is spent and respent regionally.

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Model B-1.3

$(BV_I)_{UR}$

Business Volume Stimulated by the Expenditure of University-Related Income by Regional Individuals Other Than Faculty, Staff, or Students

$$(BV_I)_{UR} = (m_i)(E_R)_{UR}$$

Providence:

$$(BV_I)_{UR} = (0.70)(\$32,360,686)$$

$$(BV_I)_{UR} = \$22,652,480$$

Rhode Island excluding Providence:

$$(BV_I)_{UR} = (0.80)(\$19,225,086)$$

$$(BV_I)_{UR} = \$15,380,069$$

Variable Description:

m_i = coefficient representing the degree to which individual income received from regional business activity is spent and respent regionally

$(E_R)_{UR}$ = University-related regional expenditures (Model B-1.1)

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Value of Regional Business Property Committed to University-Related Business

Model B-2 depicts the capital and property associated with the business activity generated by the presence of the University (as seen in Models B-1.1, B-1.2, and B-1.3). This model accumulates the portion of existing capital and property, both real and non-real, which is attributable to the flow of purchases initiated by University-related sales.

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Model B-2

$(PR_B)_{UR}$

Value of Business Property Committed to University-Related Business

$$(PB_B)_{UR} = (RP_B)_{UR} + (I_B)_{UR} + (OP_B)_{UR}$$

Providence:

$$(PB_B)_{UR} = \$38,875,777 + \$7,744,559 + \$1,028,540$$

$$(PB_B)_{UR} = \$47,648,876$$

Rhode Island excluding Providence:

$(PB_B)_{UR}$ = \$21,030,497 + \$5,006,212 + \$947,923

$(PB_B)_{UR}$ = \$26,984,632

Variable Description:

$(RP_B)_{UR}$ = value of regional business property committed to University-related business (Model B-2.1)

$(I_B)_{UR}$ = value of regional business inventory committed to University-related business (Model B-2.2)

$(OP_B)_{UR}$ = value of regional business non-real property (manufacturer's machinery and equipment) committed to University-related business (Model B-2.3)

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Model B-2.1 estimates the dollar value of local and state businesses' real property that is used to service University-related sales. This figure is computed by multiplying the market value of regional real property by the proportion of the total regional business volume that is University-related. To obtain the market value of real business property, it is necessary to employ the ratio of assessed value (V_B) to market value of taxable real property (amv). To compute a State estimate from this model, the market value of real business property (ratio of V_B to amv) is computed for each city and town, Providence excluded, and the results are then summed. The amv values used are taken from the 1978 Tax Equalization Study completed by the Rhode Island Department of Community Affairs. The most recent figures available (1977) are used. A complete discussion of this estimation procedure is found in Appendix B, page 110.

The business volume for Providence and the remainder of the State are obtained from the most recent Census of Manufacturers (1972 census). This value is the summation of retail sales, wholesale sales and selected services. An adjustment is made to update the 1972 figure to 1978 on the basis of sales tax revenue for 1972 and 1978 (see Appendix B, p. 112 and 113 for a description of this procedure).

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Model B-2.1

$(RP_B)_{UR}$

Value of Business Real Estate Property Committed to University-Related Business

Providence:

$$(RP_B)_{UR} = \frac{BV_{UR}}{BV_R} \cdot \frac{V_B}{amv}$$

$$(RP_B)_{UR} = \frac{\$62,456,124}{\$1,065,185,675} \cdot \frac{\$432,509,493}{.6564}$$

$$(RP_B)_{UR} = (0.059)(\$65,911,476)$$

$$(RP_B)_{UR} = \$38,875,777$$

Rhode Island excluding Providence:

$$(RP_B)_{UR} = \frac{BV_{UR}}{BV_R} \cdot \overset{38}{\underset{i=1}{\,}} \frac{(V_B)_i}{(amv)_i}$$

$$(RP_B)_{UR} = \frac{\$40,372,681}{\$4,358,389,642} \cdot \$2,336,721,857$$

$$(RP_B)_{UR} = (.009)(\$2,336,721,857$$

$$(RP_B)_{UR} = \$21,030,497$$

$i = 1, 2 \ldots, 38$ = cities and towns in Rhode Island (excluding Providence)

Variable Description:

BV_{UR} = University-related regional business volume (Model B-1)

BV_R = regional business volume (see Appendix B, pages 112,113)

V_B = assessed valuation of Providence business real property (see Appendix B, p. 111)

amv = Providence ratio of assessed value to market value of taxable real property (see Appendix B, p. 111)

$(V_B)_i$ = assessed valuation of business real property in i^{th} cities and towns in Rhode Island (see Appendix B, page 111)

$(amv)_i$ = ratio of assessed value to market value of taxable real property in i^{th} cities and towns in Rhode Island (see Appendix B, page 111)

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Model B-2.2 computes the value of inventory required to support University-related business. This figure is obtained by multiplying the University-related business volume (Model B-1) by the region's inventory-to-business-volume ratio (ibv). An explanation of the computation of ibv is found in Appendix B, page 114.

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Model B-2.2

$(I_B)_{UR}$

Value of Regional Business Inventory Committed
to University-Related Business

$$(I_B)_{UR} = (ibv)(BV_{UR})$$

Providence:

$$(I_B)_{UR} = (0.124)(\$62,456,124)$$

$$(I_B)_{UR} = \$7,744,559$$

Rhode Island excluding Providence:

$$(I_B)_{UR} = (0.124)(\$40,372,681)$$

$$(I_B)_{UR} = \$5,006,212$$

Variable Description:

ibv = inventory-to-business-volume ratio (see Appendix B, page 114 for the estimating procedure)

BV_{UR} = University-related business volume (Model B-1)

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Model B-2.3 estimates the value of state and local business property other than real property and inventory committed to University-related business. We considered this property to be manufacturers' equipment and machinery. The estimate of this impact is computed from the ratio of regional manufacturers' machinery and equipment to the total regional business volume, which is multiplied by the value of University-related regional business volume.

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Model B-2.3

$(OP_B)_{UR}$

Value of Regional Business Property, Other than Real Property and Inventory, Committed to University-Related Business

$$(OP_B)_{UR} = \frac{OP}{BV_R} \cdot BV_{UR}$$

Providence:

$$(OP_B)_{UR} = \frac{\$17,541,700}{\$1,065,185,675} \cdot \$62,456,124$$

$$(OP_B)_{UR} = \$1,028,540$$

Rhode Island excluding Providence:

$$(OP_B)_{UR} = \frac{\$102,331,973}{\$4,358,389,642} \cdot \$40,372,681$$

$$(OP_B)_{UR} = \$947,923$$

Variable Description:

OP = value of regional business property other than real property and inventory (source: Annual State Report on Local Government Finances and Tax Equalization, R.I. Department of Community Affairs, 1978, p. 115)

BV_R = regional business volume (Model B-2.1)

BV_{UR} = University-related regional business volume (Model B-1)

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Expansion of Rhode Island Banks' Credit Base Resulting from University-Related Deposits

Another secondary effect resulting from the economic activity of the University and its associated personnel is the expansion of the credit base of State banks. A bank's credit base is dependent upon the level of time and demand deposits which the bank holds for its customers. Not all of these deposits are available, however, to the bank for making loans and investments. A small fraction of the average time and demand deposits must be retained by the bank according to the Federal Reserve minimum reserve requirements. Therefore, the average deposits by the University, its personnel, students, and regional businesses as a consequence of their University-related business are available to State banks for loans and investments, except for the small portion which the banks must hold in legal reserve.

In Rhode Island there is a system of statewide branch banking where local deposits are not kept in the community, but are dispersed throughout the State. Hence, no local credit base creation may be meaningfully measured. For this reason, Model B-3, which estimated the extent to which bank credit is expanded as a result of University-related deposits, is calculated for the entire State of Rhode Island.

Trust accounts are fully investible by banks, thus the amount that the University has in bank trust accounts is added at the end of the model.

The University utilizes Rhode Island Banks for time deposits to the extent that such banks are competitive with banks outside of the state.

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Model B-3

CB

Expansion of Rhode Island Banks' Credit Base Resulting from University-Related Deposits

$$CB = (1 - t) \quad \overset{3}{\underset{i=1}{}}(TD_{fi} \,.\, F_i) + \overset{2}{\underset{i=1}{}}(TD_{si} \,.\, S_i) + TD_u$$

$$(1 - d) \quad DD_u + \overset{3}{\underset{i=1}{}}(DD_{fi} \,.\, F_i) + \overset{2}{\underset{i=1}{}}(DD_{si} \,.\, S_i) + (cbv)(BV_{UR}) + TA_u$$

CB = 0.97 [\$8,157,236 + \$2,163,816 + 10,000,000]

.872 [\$100,000+\$1,434,420+\$967,084+(0.0292)(\$102,828,805)]+ \$150,000

CB = \$24,663,752

Variable Description (see Appendix B-15 for values and computational details)

t = 0.03 = legal minimum deposit reserve requirement (source: Federal Reserve Bulletin, p. A 9):

TD_u = average time deposit of University in State banks

TD_{fi} = value of average time deposit for employees in the i^{th} employee category in State banks

F_i = number of employees in the i^{th} employee category

TD_{si} = value of average time deposit of students in the i^{th} student category in State banks

S_i = number of students in the i^{th} student categories

d = 0.1275 = minimum legal demand deposit requirement (source: see t above)

DD_u = average demand deposit of the University in State banks

DD_{fi} = value of average demand deposit for employees in the i^{th} employee category in State banks

DD_{si} = average demand deposit for students in the i^{th} student category in State banks

cbv = cash-to-business-volume ratio (see Appendix B, page 116 for estimating procedure)

BV_{UR} = University-related State business volume (Model B-1)

TA_u = average value of the University's trust accounts kept in State banks

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Regional Business Volume Unrealized Because of the Existence of Business Enterprises Operated by the University

The University is in competition with other local establishments to the extent that it operates business enterprises. The income that the University receives from the competing enterprises it operates may be considered as receipts foregone by other Providence business establishments. Therefore, the operation of these business activities can be said to have a negative impact on the private business sector of the Providence economy. For example, dormitories are in competition with existing or potential off-campus rental housing; University eateries with local restaurants; University-sponsored films and plays with those shown in local theaters.

Model B-4 assesses the magnitude of the market potentially available to local enterprise but currently in the domain of the University. The figures used were supplied by the University offices which handle housing, dining, parking, student activities, and other auxiliary activities.

It should be noted that this model assumes that all monies spent in the University's businesses are lost to the community. This, of course, may or may not be true. Also, the question of what businesses might have developed in the area had it not been for the University is not addressed here.

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Model B-4

$(BV_U)_U$

Providence Business Volume Unrealized Because of the Existence of University Enterprises

$$(BV_U)_U = (I_{BV})_U$$

$(BV_U)_U = \$12,280,685$

Variable Description:

$(I_{BV})_U$ - income received by the University from the operation of local and on-campus University-owned business enterprises

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Government Models

University-Related Revenues Received by the Region

Model G-1 accumulates revenues received by the City of Providence and the other 38 cities and towns in Rhode Island allocable to the University, its staff, and their business activities in the form of real estate taxes, non-real property taxes and state and federal aid and financial reimbursements. Several models use regional population figures; these are from the 1970 census. The models may be mis-stated if the actual populations differ from the census figures.

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Model G-1

R_{UR}

University-Related Revenues Received by the Region

$$R_{UR} = (R_{RE})_{UR} + (R_{NRE})_{UR} + (R_O)_{UR}$$

Providence:

$$R_{UR} = \$1,689,792 + \$911,804 + \$341,503$$

$$R_{UR} = \$2,943,099$$

Rhode Island excluding Providence:

$$R_{UR} = \$1,006,731 + \$439,688 + \$340,105$$

$$R_{UR} = \$1,786,524$$

Variable Description:

$(R_{RE})_{UR}$ = University-related real estate taxes paid to the region (see Model G-1.1)

$(R_{NRE})_{UR}$ = University-related non-real property taxes paid to the region (see Model G-1.2)

$(R_O)_{UR}$ = Other municipal revenues allocable to University-related influences. These other revenues are state and federal aid and other financial reimbursements (see Model G-1.3)

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University-related real estate taxes paid to the region

Model G-1.1 accumulates the real estate taxes paid to the City of Providence and the other 38 cities and towns in Rhode Island by the University, by faculty and staff, and by businesses for property allocable to University-related transactions. It should be noted that the University pays taxes only to the City of Providence, therefore, this element is left blank for Rhode Island excluding Providence.

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Model G-1.1

$(R_{RE})_{UR}$

University-Related Real Estate Taxes Paid to the Region

$$(R_{RE})_{UR} = (R_{RE})_U + (R_{RE})_F + (R_{RE,B})_{UR}$$

Providence:

$(R_{RE})_{UR} = \$37,181 + \$227,899 + \$1,424,712$

$(R_{RE})_{UR} = \$1,689,792$

Rhode Island excluding Providence:

$(R_{RE})_{UR} =$ --- $474,902 +$531,829

$(R_{RE})_{UR} = \$1,006,731$

Variable Description:

$(R_{RE})_U$ = Real estate taxes paid by the University through Fairview, Inc. (source: Office of Business Manager--Residence Services, for taxes paid during fiscal year 1978)

$(R_{RE})_F$ = Real estate taxes paid to regions by regional faculty and staff (see Model G-1.1.1)

$(R_{RE,B})_{UR}$ = Real estate taxes paid to regions by regional businesses for real property allocable to University-related influences (see Model G-1.1.2)

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Model G-1.1.1 represents real estate taxes paid by faculty and staff to the government of the city or town in which they reside. As students are unlikely to own homes, they have been excluded from this model, potentially underestimating the results. This model is based on the assumption that University personnel live in houses with an average value. First the number of University households in each locality was multiplied by the proportion of owned housing to obtain the number of houses owned by University faculty and staff per region. This figure was then multiplied by the average property tax per private residence in the proper city or town to give total taxes paid by Brown personnel. Average property tax, as used above, was calculated by dividing total assessed valuation of all private residences in a region by the number of private residences in that region and multiplying the quotient by the local property tax rate.

In addition to computing Model G-1.1.1 for Providence and Rhode Island excluding Providence, computations have been done for five other cities and towns within the State--Barrington, Cranston, East Providence, Pawtucket, and Warwick. As noted in Chapter 2, 79% of the University's faculty and staff reside in either Providence or one of these cities. Please keep in mind that these five regions are also included in the results for Rhode Island excluding Providence. This model is stated twice due to slight variations in format.

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Model G-1.1.1

$(R_{RE})_F$

Real Estate Taxes Paid to Regional Governments by Regional Faculty and Staff

$$(R_{RE})_F = (F_R)(f_O) \quad pt \cdot \frac{V_{PR}}{N_{PR}}$$

Providence:

$$(R_{RE})_F = (1146)(0.404) \quad .05618 \; . \; \frac{\$553,292,997}{63,148}$$

$$(R_{RE})_F = \$227,899$$

Barrington:

$$(R_{RE})_F = (114)(0.710) \quad .032 \; . \; \frac{\$243,987,712}{4,816}$$

$$(R_{RE})_F = \$131,218$$

Cranston:

$$(R_{RE})_F = (77)(0.710) \quad .07695 \; . \; \frac{\$228,677,092}{22,055}$$

$$(R_{RE})_F = \$43,619$$

East Providence:

$$(R_{RE})_F = (211)(0.710) \quad .0544 \; . \; \frac{\$193,903,865}{15,144}$$

$$(R_{RE})_F = \$104,348$$

Pawtucket:

$$(R_{RE})_F = (83)(0.710) \quad .07196 \; . \; \frac{\$172,645,831}{26,687}$$

$$(R_{RE})_F = \$27,434$$

Warwick:

$$(R_{RE})_F = (80)(0.710) \quad .0339 \; . \; \frac{\$827,931,443}{24,927}$$

$$(R_{RE})_F = \$63,054$$

Rhode Island excluding Providence:

$$(R_{RE})_F = (F_R()f_o) \quad \mathop{\quad}\limits^{38}_{i=1} \; . \; pt_i \; . \; \frac{V_{PRi}}{N_{PRi}}$$

$$(R_{RE})_F = \$474,902$$

i = 1, 2...., 38 = cities and towns in Rhode Island excluding Providence (source: Journal-Bulletin R.I. Almanac, 1979, p. 179)

Variable Description:

F_R = number of faculty and staff households in the region (see Table 12)

f_O = proportion of faculty and staff in the region who own homes (see Appendix B, Table 24, 1976 study)

pt = regional property tax rate, 1977 source: Annual State Report on Local Government Finances and Tax Equalization, State Department of Community Affairs, 1978, p. 14)

V_{PR} = total assessed valuation of regional private residences as of 12/31/77 (see Appendix B, p. 118)

N_{PR} = total number of regional private residences in 1970 (source: 1970 Census of Population and Housing, HC(1)A41, Rhode Island, The U.S. Bureau of the Census)

(Note: variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence.)

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Model G-1.1.2 estimates the amount of real estate taxes received from businesses by regional governments for real property allocable to University-related business transactions. The assumption behind this model is that a portion of business real property is committed to University-related business, therefore, a portion of real estate taxes collected is attributable to the presence of the University. Regional business volume of the University is divided by total regional business volume to obtain the proportion of business volume in the region that is University-related. This proportion multiplied by total business real estate taxes collected in a region produces the portion of real estate taxes in that region allocable to the presence of the University. Total business real estate taxes collected in a region are the product of that region's property tax rate and the assessed value of business real property. This model is stated twice due to slight variations in format.

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Model G-1.1.2

$(R_{RE,B})_{UR}$

Real Estate Taxes Paid Regional Governments by Regional Business for Real Property Allocable to University-Related Business

$$(R_{RE,B})_{UR} = \left(\frac{BV_{UR}}{BV_R}\right)(V_B)(pt)$$

Providence:

$$(R_{RE,B})_{UR} = \left(\frac{\$62,456,124}{\$1,065,185,675}\right)(\$432,509,493)(.05618)$$

$$(R_{RE,B})_{UR} = \$1,424,712$$

Rhode Island excluding Providence:

$$(R_{RE,B})_{UR} = \left(\frac{BV_{UR}}{BV_R}\right) \mathop{}_{i=1}^{38} (V_{Bi})(pt_i)$$

$$(R_{RE,B})_{UR} = \$531,829$$

$i = 1, 2...., 38$ = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

BV_{UR} = University-related regional business volume (see Model B-1)

BV_R = regional business volume (see Appendix B, pages 112,113)

V_B = assessed valuation of regional business real property as of 12/31/78 (see Appendix B, p. 111)

pt = regional property tax rate, 1978 (see Model G-1.1.1)

(Note: variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence)

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University-related non-real property taxes paid to the region

Model G-1.2 accumulates non-real property taxes paid to regional governments by employees of the University and by businesses for non-real property allocable to University-related business volume. Non-real property taxes are collected in three forms; motor vehicle taxes, manufacturers' machinery and equipment taxes, and tangible and personal property taxes. Model G-1.2

comprises the above three summed.

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Model G-1.2

$(R_{NRE})_{UR}$

University-Related Non-real Property Taxes Paid to the Region

$$(R_{NRE})_{UR} = (R_{NRE,MV})_{UR} + (R_{NRE,MM})_{UR} + (R_{NRE,PP})_{UR}$$

Providence:

$$(R_{NRE})_{UR} = \$171,060 + \$128,351 + \$612,393$$

$$(R_{NRE})_{UR} = \$911,804$$

Rhode Island:

$$(R_{NRE})_{UR} = \$143,938 + \$49,024 + \$246,726$$

$$(R_{NRE})_{UR} = \$439,688$$

Variable Description:

$(R_{NRE,MV})_{UR}$ = motor vehicle taxes paid to regional governments allocable to University-related influences (see Model G-1.2.1)

$(R_{NRE,MM})_{UR}$ = manufacturers' machinery taxes paid to regional governments allocable to University-related influences (see Model G-1.2.2)

$(R_{NRE,PP})_{UR}$ = tangible and personal property taxes paid to regional governments allocable to University-related influences (see Model G-1.2.3)

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Model G-1.2.1 estimates the value of motor vehicle taxes paid to regional governments by regional faculty and staff. The University's vehicles are exempt from this type of tax. This model is based on two major assumptions; University personnel own automobiles to an extent that is consistent with the general population (in number and value), and tax revenues from business vehicles are allocable on a population basis. Since Model G-1.2.1 is based on population, the first step is to calculate the proportion of regional population that is University-related. This is achieved by adding the total number of people in faculty and staff households to the total number in student households and dividing the sum by the population of the region in question. One student group has been excluded--those living on campus--the rationale being that cars owned by this group are most likely to have out-of-state registrations. To the extent that the above is not true, this model is understated. However, it is probable that some persons included in the above proportion also own cars with out-of-state registrations, counteracting the understatement. Total taxes paid to a region are the product of the region's property tax rate and the assessed value of all automobiles registered in that region. This product multiplied by the proportion of the population that is University-related results in the value of motor vehicle taxes paid by University-related persons.

Since this model is based on population, the five additional cities discussed in Model G-1.1.1 have been included. Again, the model is stated twice due to slight variations in format.

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Model G-1.2.1

$(R_{NRE,MV})_{UR}$

Motor Vehicle Taxes Paid to Regional Governments Allocable to University-Related Influences

$$(R_{NRE,MV})_{UR} = \frac{FH_R + SH_R}{POP_R} (pt)(V_{MV})$$

Providence:

$$(R_{NRE,MV})_{UR} = \frac{3060 + 1796}{179{,}116} (o.05618)(\$112{,}310{,}991)$$

$$(R_{NRE,MV})_{UR} = \$171{,}060$$

Barrington:

$$(R_{NRE,MV})_{UR} = \frac{369 + 33}{17{,}554} (0.032)(\$18{,}719{,}772)$$

$$(R_{NRE,MV})_{UR} = \$13{,}718$$

Cranston:

$$(R_{NRE,MV})_{UR} = \frac{249 + 43}{74,287} (0.07695)(\$62,258,261)$$

$$(R_{NRE,MV})_{UR} = \$18,831$$

East Providence:

$$(R_{NRE,MV})_{UR} = \frac{684 + 41}{48,207} (0.0544)(\$41,161,851)$$

$$(R_{NRE,MV})_{UR} = \$33,676$$

Pawtucket:

$$(R_{NRE,MV})_{UR} = \frac{269 + 51}{76,984} (0.07196)(\$58,380,352)$$

$$(R_{NRE,MV})_{UR} = \$17,463$$

Warwick:

$$(R_{NRE,MV})_{UR} = \frac{259 + 38}{83,694} (0.0339)(\$97,198,454)$$

$$(R_{NRE,MV})_{UR} = \$11,693$$

Rhode Island excluding Providence:

$$(R_{NRE,MV})_{UR} = \frac{FH_R + SH_R}{POP_R} \mathop{}\limits_{i=1}^{38} (pt_i)(V_{MVi})$$

$$(R_{NRE,MV})_{UR} = \$143,938$$

$i = 1, 2 \ldots, 38$ = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

FH_R = the number of related persons (husband, wife and dependents) living in faculty and staff households within the region (see Table 25)

SH_R = the number of related persons (husband, wife and dependents) living in student households within the region (excluding on-campus students) (see Table 25)

POP_R = population of the region (source: Journal-Bulletin Rhode Island Almanac, 1979, p. 178)

pt = regional property tax rate, 1977 (see Model G-1.1.1)

V_{MV} = Total assessed value of motor vehicles in the region as of 12/31/77 (see Appendix B, p. 121)

(Note: variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence.)

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Model G-1.2.2 represents the amount of tax revenues collected by regional governments from businesses in the form of manufacturers' machinery taxes which are allocable to University-related influences. This model is based on the same premise as Model G-1.1.2; a portion of the tax revenue from manufacturers' machinery is allocable on the basis of University-related business volume. This model does vary from Model G-1.1.2 in one aspect. The State of Rhode Island reimburses every city and town a certain amount of money under a 1969 agreement which lowered maximum assessment ratios on manufacturers' machinery. Revenues from this source reflect assessment ratios in use before the agreement.

The first step in estimating Model G-1.2.2 is to ascertain the proportion of regional business that is University-related. As in Model G-1.1.2, this is done by dividing regional business volume of the University by total regional business volume. This proportion multiplied by total manufacturers' machinery tax revenues results in the dollar value of tax revenues allocable to the presence of the University. Total manufacturers' machinery tax revenues are derived by multiplying the assessed value of manufacturers' machinery and equipment by the manufacturers' tax rate in each region and adding the product to the revenues received from the manufacturers' machinery tax reimbursement by that region.

Model G-1.2.2 is stated twice due to slight variations in format.

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Model G-1.2.2

$(R_{NRE,MM})_{UR}$

Manufacturers' Machinery Taxes Paid to Regional Governments
Allocable to University-Related Influences

$$(R_{NRE,MM})_{UR} = \frac{BV_{UR}}{BV_R} \quad (mt)(V_M) + RBM$$

Providence:

$$(R_{NRE,MM})_{UR} = (\frac{\$62,456,124}{\$1,065,185,675}(0.07165)(\$17,541,700) + (\$932,152)$$

$$(R_{NRE,MM})_{UR} = \$128,351$$

Rhode Island excluding Providence:

$$(R_{NRE,MM})_{UR} = \frac{BV_{UR}}{BV_R} \quad \overset{38}{\underset{i=1}{}} \quad (mt_i)(V_{Mi}) + RBM_i$$

$$(R_{NRE,MM})_{UR} = \$49,024$$

i = 1, 2...., 38 = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

BV_{UR} = University-related regional business volume (see Model B-1)

BV_R = regional business volume (see Appendix B, p. 112)

mt = regional manufacturers' tax rate, 1977 (source: Annual State Report on Local Government Finances and Tax Equalization, State Department of Community Affairs, 1978, p. 115)

V_M = total assessed valuation of regional manufacturers' machinery and equipment as of 12/31/77 (source: the same as for mt stated above)

RBM = regional manufacturers' machinery and equipment tax reimbursement from the State of Rhode Island for 1977 (source: State of Rhode Island Annual Financial Report, 1978, p. 261)

(Note: variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence.)

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Model G-1.2.3 estimates the portion of tangible and personal property taxes paid to regional governments allocable to

University-related influences. As for manufacturers' machinery taxes, these taxes are allocated on the basis of University business volume in a region. Unfortunately, a small portion of the taxes collected in this category come from individuals rather than businesses for the ownership of such items as boats and mobile homes. To the extent that University employees own such items, this model is understated.

Again, as in previous models, the University proportion of regional business volume is obtained using methods explained in Models G-1.1.2 and G-1.2.2. This proportion is multiplied by total tangible and personal property taxes collected in the region resulting in the value of tax revenues attributable to the University. Total tangible and personal property taxes consist of the regional property tax rate times the assessed value of tangible and personal property plus a tax reimbursement from the State. This reimbursement was begun around thirteen years ago when certain inventories and raw materials were exempted from taxation by cities and towns and is based on taxes collected before the exemption went into effect.

Model G-1.2.3 is stated twice due to slight variations in format.

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Model G-1.2.3

$(R_{NRE,PP})_{UR}$

Tangible and Personal Property Taxes Paid to Regional Governments Allocable to University-Related Influences

$$(R_{NRE,PP})_{UR} = \frac{BV_{UR}}{BV_R} (pt)(V_{PP}) + RBI$$

Providence:

$$(R_{NRE,PP})_{UR} = (\frac{\$62,456,124}{\$1,065,185,675} (0.05618)(\$175,275,750) + (\$597,344)$$

$$(R_{NRE,PP})_{UR} = \$612,393$$

Rhode Island excluding Providence:

$$(R_{NRE,PP})_{UR} = \frac{BV_{UR}}{BV_R} \; {}_{i=1}^{38} \; (pt)(V_{PPi}) + RBI_i$$

$$(R_{NRE,PP})_{UR} = \$246,726$$

Variable Description:

BV_{UR} = University-related regional business volume (see Model B-1)

BV_R = regional business volume (see Appendix B, p. 112)

pt = regional property tax rate, 1977 (see Model G-1.1.1)

V_{PP} = total assessed valuation of regional tangible and personal property as of 12/31/77 (see Appendix B, page 121)

RBI = regional manufacturer's inventory tax reimbursement from the State of Rhode Island for 1977 (source: same as RBM--see Model G-1.2.2)

(Note: variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence)

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Other regional revenues allocable to University-related influences

Model G-1.3 accumulates all other revenues received by regional governments attributable to the presence of the University. These revenues are noneducational and educational, the noneducational ones being further divisible into those based on population and those based on property taxes. Revenues are distributed in the form of State and Federal aid and other financial reimbursements.

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Model G-1.3

$(R_O)_{UR}$

Other Regional Revenues Allocable to University-Related Influences

$$(R_O)_{UR} = (R_{O,NE,P})_{UR} + (R_{O,NE,PR})_{UR} + (R_{O,E})_{UR}$$

Providence:

$$(R_O)_{UR} = \$27,423 + \$28,011 + \$286,069$$

$$(R_O)_{UR} = \$341,503$$

Rhode Island excluding Providence:

$$(R_O)_{UR} = \$3,322 + \$15,911 + \$320,872$$

$$(R_O)_{UR} = \$340,105$$

Variable Description:

$(R_{O,NE,P})_{UR}$ = other regional noneducational revenues based on population allocable to University-related influences (see Model G-1.3.1)

$(R_{O,NE,PR})_{UR}$ = other regional noneducational revenues based on property taxes allocable to University-related influences (see Model G-1.3.2)

$(R_{O,E})_{UR}$ = state and federal aid to regional governments for education allocable to University-related influences (see Model G-1.3.3)

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Model G-1.3.1 estimates regional revenues received from the State and based on population, which are allocable to University-related influences. Two types of state aid are included here; a share of the taxes collected for the manufacturing of alcoholic beverages, and a reimbursement for intangible personal property taxes which are no longer collected. In the latter case, the reimbursement is based on the amount of intangible property taxes last collected before agreement was reached to end this type of taxation. The total revenue from these two sources in each region is multiplied by the proportion of the population in that region which is University-related to obtain the portion of this type of revenue which is attributable to the University. The proportion of a region's population which is University-related is derived by adding the number of persons in regional faculty and staff households to the number of persons in regional student households (excluding students living on-campus) and dividing the sum by the total population of the region. This model is stated twice due to slight variations in format.

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Model G-1.3.1

$(R_{O,NE,P})UR$

Other Regional Noneducational Revenues Based on Population Allocable to University-Related Influences

$$(R_{O,NE,P})UR = OR_P \; \frac{FH_R + SH_R}{POP_R}$$

Providence:

$$(R_{O,NE,P})UR = \$1{,}011{,}501 \; \left(\frac{3060 + 1796}{179{,}116}\right)$$

$$(R_{O,NE,P})UR = \$27{,}423$$

Rhode Island excluding Providence:

$$(R_{O,NR,P})UR = \underset{i=1}{\overset{38}{}} \; OR_{Pi} \; \frac{FH_R + SH_R}{POP_R}$$

$$(R_{O,NE,P})UR = \$3{,}322$$

i = 1, 2...., 38 = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

OR_P = regional revenues for 1978 based on population including intangible personal property tax reimbursement and the share of taxes from manufacturers of alcoholic beverages (source: State of Rhode Island Annual Financial Report, 1978, p. 261)

FH_R = the number of related persons (husband, wife, and dependents) living in faculty and staff households within the region (see Model G-1.2.1)

SH_R = the number of related persons (husband, wife, and dependents) living in student households in the region, excluding on-campus students (see Model G-1.2.1)

POP_R = population of the region (see Model G-1.2.1)

(Note: variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence.)

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Model G-1.3.2 computes the amount of revenues collected by regional governments from the State based on property taxes allocable to University-related influences. Two types of revenues received by cities and towns from the State are based on the amount of property taxes collected within a city and the ratio of that amount to total property taxes collected throughout the State. These revenues are "State Aid" and a share of the taxes collected for horse racing, dog racing and jai alai. The total amount received by each region multiplied by the proportion of regional property taxes collected which are University-related gives the value of this type of revenue which is allocable to University-related influences. The proportion of property taxes collected which are University-related is obtained by dividing property taxes paid to regional governments allocable to University-related influences by total property taxes paid to regional governments. The types of property taxes involved are both real and non-real. This model is stated twice due to slight variations in format.

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Model G-1.3.2

$(R_{O,NE,PR})_{UR}$

Other Regional Noneducational Revenues Based on Property Taxes Allocable to University-Related Influences

$$(R_{O,NE,PR})_{UR} = OR_{PR} \frac{(R_{RE})_{UR} + (R_{NRE})_{UR}}{(V_{PR} + V_B + V_{MV} + V_{PP})(pt) + (V_M)(mt)}$$

Providence:

$$(R_{O,NE,PR})_{UR} =$$

$$\$783,792 \left[\frac{\$1,689,792 + \$911,804}{\$553,292,997 + \$432,509,493 + \$112,310,991 + \$175,275,750(0.05618) + (17541700)(0.07165)}\right.$$

$$(R_{O,NE,PR})_{UR} = \$28,011$$

Rhode Island excluding Providence:

$$(R_{O,NE,PR})_{UR} = \sum_{i=1}^{38} OR_{PR_i} \frac{(R_{RE})_{UR} + (R_{NRE})_{UR}}{\sum_{i=1}^{38} (V_{PRi} + V_{Bi} + V_{MVi} + V_{PPi})(pt_i) + (V_{Mi})(mt_i)}$$

$$(R_{O,NE,PR})_{UR} = \$15,911$$

$i = 1, 2 \ldots, 38$ = other cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

OR_{PR} = regional revenues for 1978 based on property taxes collected including state aid and the share of taxes from horse racing (source: State of Rhode Island Annual Financial Report, 1978, pp. 261,262)

$(R_{RE})_{UR}$ = University-related real estate taxes paid to regional governments (see Model G-1.1)

$(R_{NRE})_{UR}$ = University-related non-real property taxes paid to regional governments (see Model G-1.2)

V_{PR} = total assessed valuation of regional private residences (see Model G-1.1.1)

V_B = assessed valuation of regional business real property (see Model G-1.1.2)

V_{MV} = total assessed value of motor vehicles in the region (see Model G-1.2.1)

V_{PP} = total assessed valuation of regional tangible and personal property (see Model G-1.2.3)

pt = regional property tax rate (see Model G-1.1.1)

V_M = total assessed valuation of regional manufacturers' machinery and equipment (see Model G-1.2.2) mt = regional manufacturers' tax rate (see Model G-1.2.2)

(Note: Variables to the i^{th} degree are summed over the 38 cities and towns in Rhode Island excluding Providence)

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Model G-1.3.3 estimates the amount of state and federal aid for education received by regional governments attributable to the presence of the University. This model is based on two regional University assumptions: 1) that aid is distributed to school districts on a per student basis, and 2) that University-related children attending public schools exist in the same proportions to households as they did in 1976. To the extent that the above premises are untrue, this model may be mis-stated. The proportion of University-related children attending public schools in a region is ascertained in the following manner: the number of regional faculty and staff public school children is added to the number of regional student public school children and the sum is divided by the regional public school enrollment. This proportion is then multiplied by total state and federal aid to find the amount of aid allocable to University-related influences.

Model G-1.3.3 has been expanded to include the five cities discussed in Model G-1.1.1. It is stated twice due to slight variations in format.

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Model G-1.3.3

$(R_{O,E})_{UR}$

State and Federal Aid to Regional Governments
for Education Allocable to University-Related Influences

$$(R_{O,E})_{UR} = \frac{(CH_{PS})_F + (CH_{PS})_S}{CH_{PS}} \; A_{PS}$$

Providence:

$$(R_{O,E})_{UR} = \left(\frac{454 + 30}{19,493}\right) \$11,521,385$$

$$(R_{O,E})_{UR} = \$286,069$$

Barrington:

$$(R_{O,E})_{UR} = \left(\frac{70 + 2}{3,766}\right) \$1,836,480$$

$$(R_{O,E})_{UR} = \$35,111$$

Cranston:

$$(R_{O,E})_{UR} = \left(\frac{47 + 3}{12,718}\right) \$5,472,516$$

$$(R_{O,E})_{UR} = \$21,515$$

East Providence:

$$(R_{O,E})_{UR} = \left(\frac{130 + 3}{9,177}\right) \$3,058,112$$

$$(R_{O,E})_{UR} = \$44,320$$

Pawtucket:

$$(R_{O,E})_{UR} = \left(\frac{51 + 4}{10,391}\right) \$6,251,933$$

$$(R_{O,E})_{UR} = \$33,092$$

Warwick:

$$(R_{O,E})_{UR} = \left(\frac{49 + 3}{17,124}\right) \$8,309,272$$

$$(R_{O,E})_{UR} = \$25,232$$

Rhode Island excluding Providence:

$$(R_{O,E})_{UR} = \frac{(CH_{PS})_F + (CH_{PS})_S}{CH_{PS}} \mathop{}\limits_{i=1}^{38} A_{PSi}$$

$$(R_{O,E})_{UR} = \$320,872$$

$i = 1, 2 \ldots, 38$ = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

$(CH_{PS})_F$ = the number of faculty and staff children in regional public schools (see Table 26)

$(CH_{PS})_S$ = the number of student children in regional public schools (see Table 26)

CH_{PS} = regional public school enrollment as of October, 1977 (source: Journal-Bulletin Rhode Island Almanac, 1979, p. 171)

A_{PS} = regional state and federal aid to public schools for the 1977-78 school year (source: the same as above for CH_{PS}, pp. 169, 170)

(Note: variables to the i^{th} degree are summed over 38 cities and towns in Rhode Island excluding Providence)

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University-Related Revenues Received by the State Government

This model accumulates revenues received by the State of Rhode Island allocable to University-related influences. These revenues are collected in the form of taxes and include population taxes (sales, motor fuel, etc.), income taxes, and business taxes. All taxes connected with horse racing have been excluded based on the premise that the University has no effect on the horse racing industry or taxes collected from it. Model G-2 and all submodels are computed only once for the entire State including Providence.

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Model G-2

SR_{UR}

University-Related Revenues Received by the State Government

$$SR_{UR} = (SR_{PT})_{UR} + (SR_{IT})_{UR} + (SR_{BT})_{UR}$$

SR_{UR} = \$3,256,062 + \$947,488 + \$1,875,251

SR_{UR} = \$6,078,801

Variable Description:

$(SR_{PT})_{UR}$ = State Government population taxes allocable to University-related influences (see Model G-2.1)

$(SR_{IT})_{UR}$ = State income taxes allocable to University-related influences (see Model G-2.2)

$(SR_{BT})_{UR}$ = State government business taxes allocable to University-related influences (see Model G-2.3)

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Model G-2.1 calculates the amount of state population taxes attributable to the presence of the University. Population taxes are regressive in nature and, thus, fall on all persons equally. Therefore, population is used as a means of determining the portion that is University-related. First the proportion of the State population that is University-related is determined by adding the total number of persons in faculty and staff households in Rhode Island to the total number in student households in Rhode Island and dividing the sum by the total state population. This proportion multiplied by the total amount of population taxes collected yields the amount allocable to the University.

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Model G-2.1

$(SR_{PT})_{UR}$

State Government Population Taxes Allocable to
University-Related Influences

$$SR_{PT})_{UR} = \frac{FH_R + SH_R}{POP_R} SR_{PT}$$

$$(SR_{PT})_{UR} = \left(\frac{5,842 + 7,387}{949,723}\right) \$233,755,904$$

$$(SR_{PT})_{UR} = \$3,256,062$$

Variable Description:

FH_R = the number of related persons (husband, wife and dependents) living in faculty and staff households in the region (see Model G-1.2.1)

SH_R = the number of related persons (husband, wife and dependents) living in student households in the region--including on-campus students (see Model G-1.2.1)

POP_R = the total population of the region--in this case the State (source: see Model G-1.2.1)

SR_{PT} = State population taxes collected during the fiscal year ending June 30, 1978 and consisting of the following: motor vehicle tax, gasoline tax, and tobacco products tax (source: State of Rhode Island Annual Financial Report, 1978, p. 68)

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Model G-2.2 estimates State income taxes allocable to University-related influences. This is achieved by calculating the proportion of personal income in the State that is earned by University-related persons and then multiplying that proportion by total income taxes collected.

In calculating the percentage of State personal income tax that is earned by University-related persons, only faculty, staff and graduate students have been considered. It is assumed that undergraduate students' incomes are too small to be taxed and have, therefore, been excluded here. Total faculty, staff and graduate student household income before withholding divided by total State personal income yields the University-related proportion of State personal income.

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Model G-2.2

$(SR_{IT})_{UR}$

State Income Tax Allocable to University-Related Influences

$$(SR_{IT})_{UR} = \frac{I_F + I_{GS}}{PI_S} \quad SR_{IT}$$

$$(SR_{IT})_{UR} = \left(\frac{\$47,313,348 + \$6,185,700}{\$6,322,000,000}\right) \$111,964,974$$

$$(SR_{IT})_{UR} = \$947,488$$

Variable Description:

I_F = total faculty and staff household income before withholding (see Table 27)

I_{GS} = total graduate student household income before withholding (see Table 27)

PI_S = total personal income in the State for 1977 (source: Journal-Bulletin Rhode Island Almanac, 1979, p. 182)

SR_{IT} = State income taxes collected during the fiscal year ending June 30, 1978 (source: the same as for SR_{PT} in Model G-2.1)

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Model G-2.3 estimates revenues received by the State government in the form of business taxes which are allocable to University-related influences. Businesses pay taxes to the State for the following: tax on deposits; tax on insurance companies; tax on manufacturers of beers, liquors, etc.; income tax--financial institutions; non-resident contractor tax recovery; business corporation tax; gross earnings tax; franchise tax; alcoholic beverage import fees; realty transfer tax. The University-related portion of these taxes is distributed on the basis of University-related business volume using the rationale discussed in Model G-1.1.2. The proportion of state business volume that is University-related is a function of statewide University-related business volume divided by total statewide business volume. This proportion multiplied by total business taxes paid to the State government results in the portion of this type of revenue attributable to the presence of the University.

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Model G-2.3

$(SR_{BT})_{UR}$

State Government Business Tax Allocable to University-Related Influences

$$(SR_{BT})_{UR} = \frac{BV_{UR}}{BV_R} \; SR_{BT}$$

$$(SR_{BT})_{UR} = \left(\frac{\$102,828,805}{\$5,423,575,317}\right) \$98,907,766$$

$$(SR_{BT})_{UR} = \$1,875,251$$

Variable Description:

BV_{UR} = University-related regional business volume; in this case for the entire State including Providence (see Model B-1)

BV_R = regional business volume; in this case for the entire State including Providence (see Appendix B, p. 113)

SR_{BT} = State business taxes collected during the fiscal year ending June 30, 1978 (source: the same as for SR_{PT} in Model G-2.1)

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Value of Municipal-Type Services Self-Provided by the University

Brown University provides certain municipal services for itself which would otherwise have to be provided by the City of Providence. Thie model calculates the value of such services.

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Model G-3

$(OC_M)_{SU}$

Value of Municipal-Type Services Self-Provided by the University

$(OC_M)_{SU}$ = \$606,428 (see Table 28 for a list of these expenses)

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Operating Cost of Regional Government-Provided Municipal and Public School Services Allocable to University-Related Influences

Model G-4 accounts for operating costs of regional governments for services which are attributable to the University. The two major costs involved are for municipal services and for public school services. The portion of each of these allocable to University-related influences is added together to obtain the results for Model G-4.

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Model G-4

$(OC_S)_{UR}$

Operating Cost of Regional Government-Provided Municipal and Public School Services Allocable to University-Related Influences

$$(OC_S)_{UR} = (OC_{MS})_{UR} + (OC_{PSS})_{UR}$$

Providence:

$(OC_S)_{UR}$ = \$614,794 + \$908,699

$(OC_S)_{UR}$ = \$1,523,493

Rhode Island excluding Providence:

$(OC_S)_{UR}$ = \$284,455 + \$821,492

$(OC_S)_{UR}$ = \$1,105,947

Variable Description:

$(OC_{MS})_{UR}$ = operating cost of government-provided municipal services allocable to University-related influences (see Model G-4.1)

$(OC_{PSS})_{UR}$ = operating cost of regional public schools allocable to University-related influences (see Model G-4.2)

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Model G-4.1 expresses the cost of regional government-provided municipal services allocable to the University. Population has been used as a basis for deriving this model. This, however, ignores the fact that such an approach has the potential of overestimating the costs of services to the University by implicitly underestimating the services rendered to business establishments.

The first step is to establish the proportion of the regional population which is University-related. As in Model G-1.3.1, this is accomplished by adding the total number of persons in faculty and staff households to the total number in student households and dividing the sum by the total regional population. Students living on campus are excluded since they receive services through the University. The proportion of the population associated with the University is then multiplied by the cost of municipal services to obtain the cost of services allocable to University-related influences. The following municipal services have been included: public safety; public works; sanitation; public health; parks and recreation.

The five cities and towns other than Providence in which the greatest number of University faculty and staff and students live have been included in Model G-4.1. The model is stated twice due to slight variations in format.

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Model G-4.1

$(OC_{MS})_{UR}$

Operating Cost of Government-Provided Municipal Services Allocable to University-Related Influences

$$(OC_{MS})_{UR} = \frac{FH_R + SH_R}{POP_R} \quad B_{MS}$$

Providence:

$$(OC_{MS})_{UR} = \left(\frac{3,060 + 1,796}{179,116}\right) \$22,676,994$$

$$(OC_{MS})_{UR} = \$614,794$$

Barrington:

$$(OC_{MS})_{UR} = \left(\frac{369 + 33}{17,554}\right) \$1,928,132$$

$$(OC_{MS})_{UR} = \$44,156$$

Cranston:

$$(OC_{MS})_{UR} = \left(\frac{249 + 43}{74,287}\right) \$5,315,459$$

$$(OC_{MS})_{UR} = \$20,893$$

East Providence:

$$(OC_{MS})_{UR} = \left(\frac{684 + 41}{48,207}\right) \$5,489,903$$

$$(OC_{MS})_{UR} = \$84,272$$

Pawtucket:

$$(OC_{MS})_{UR} = \left(\frac{269 + 51}{76,984}\right) \$8,980,079$$

$$(OC_{MS})_{UR} = \$37,328$$

Warwick:

$$(OC_{MS})_{UR} = \left(\frac{259 + 38}{83,694}\right) \$8,965,533$$

$$(OC_{MS})_{UR} = \$31,815$$

Rhode Island excluding Providence:

$$(OC_{MS})_{UR} = \frac{FH_R + SH_R}{POP_R} \quad \overset{38}{\underset{i=1}{\quad}} \; B_{MSi}$$

$$(OC_{MS})_{UR} = \$284,455$$

$i = 1, 2...., 38$ = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

FH_R = the number of related persons (husband, wife, and dependents) living in faculty and staff households in the region (see Model G-1.2.1)

SH_R = the number of related persons (husband, wife, and dependents) living in student households in the region, excluding on-campus students (see Model G-1.2.1)

POP_R = population of the region (see Model G-1.2.1)

B_{MS} = regional budget for municipal services (source: Annual State Report on Local Government Finances and Tax Equalization, State Department of Community Affairs, 1978, pp. 20-96)

(Note: Variables to the i^{th} degree have been summed over 38 cities and towns in Rhode Island excluding Providence)

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Model G-4.2 estimates the operating costs of regional public schools allocable to University-related influences. In this case, the proportion of regional faculty and staff and student children enrolled in public schools is multiplied by the public school operating budget to obtain the desired result.

As in Model G-4.1, the cities of Barrington, Cranston, East Providence, Pawtucket, and Warwick are included here. The model is stated twice due to slight variations in format.

* * * * * * * * * * * *

Model G-4.2

$(OC_{PSS})_{UR}$

Operating Cost of Local Public Schools Allocable to University-Related Influences

$$(OC_{PSS})_{UR} = \frac{(CH_{PS})_F + (CH_{PS})_S}{CH_{PS}} \; B_{PSS}$$

Providence:

$$(OC_{PSS})_{UR} = \left(\frac{454 + 30}{19,493}\right) \$36,597,670$$

$$(OC_{PSS})_{UR} = \$908,699$$

Barrington:

$$(OC_{PSS})_{UR} = (\frac{70 + 2}{3,766})\ \$6,411,343$$

$$(OC_{PSS})_{UR} = \$122,575$$

Cranston:

$$(OC_{PSS})_{UR} = (\frac{47 + 3}{12,718})\ \$19,998,582$$

$$(OC_{PSS})_{UR} = \$78,623$$

East Providence:

$$(OC_{PSS})_{UR} = (\frac{130 + 3}{9,177})\ \$11,379,048$$

$$(OC_{PSS})_{UR} = \$163,464$$

Pawtucket:

$$(OC_{PSS})_{UR} = (\frac{51 + 4}{10,391})\ \$16,622,194$$

$$(OC_{PSS})_{UR} = \$87,982$$

Warwick:

$$(OC_{PSS})_{UR} = (\frac{49 + 3}{17,124})\ \$28,556,804$$

$$(OC_{PSS})_{UR} = \$86,718$$

Rhode Island excluding Providence:

$$(OC_{PSS})_{UR} = \frac{(CH_{PS})_F + (CH_{PS})_S}{CH_{PS}} \quad \underset{i=1}{\overset{38}{}} \quad B_{PSSi}$$

$$(OC_{PSS})_{UR} = \$821,492$$

$i = 1, 2...., 38$ = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

$(CH_{PS})_F$ = the number of faculty and staff children in regional public schools (see Model G-1.3.3)

$(CH_{PS})_S$ = the number of student children in regional public schools (see Model G-1.3.3)

CH_{PS} = regional public school enrollment as of October, 1977 (see Model G-1.3.3)

B_{PSS} = regional budget for public school services (source: the same as for B_{MS} is Model G-4.1)

(Note: variables to the i^{th} degree have been added over 38 cities and towns in Rhode Island excluding Providence)

* * * * * * * * * * * *

Value of Regional Government Property Allocable to the University-Related Portion of Services Provided

Model G-5 calculates the value of regional government property used to support services provided to the University and persons associated with it. This is accomplished without attempting to show how much capital outlay will be needed specifically to provide such services, thus avoiding a set of assumptions about capital investments which are beyond the scope of this study.

Model G-5 is based on Models G-4.1 and G-4.2 in that the proportions of municipal and public school services that are University-related are used to determine the portions of government property that are University-related. This is accomplished by first determining the above-mentioned proportions. In each case the proper proportion is then multiplied by the associated value of regional government property--the proportion of University-related municipal services by the value of municipal property (excluding public school property), and the proportion of University-related public school services by the value of regional public school property. These two added together yield the value of regional government property attributable to the University.

In computing this model, a problem arose concerning the value of municipal government properties in cities and towns other than Providence. The values for Providence were obtained from the City's 1975 financial report; however, similar information for the other municipalities was not readily available. Therefore, data used by the University of Rhode Island to complete their 1973 Economic Impact Study were used.

Model G-5 is stated twice due to slight variations in format.

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Model G-5

GP_{UR}

Value of Regional Government Properties Allocable to the University-Related Portion of Services Provided

$$GP_{UR} = \frac{(OC_{MS})_{UR}}{B_{MS}} (GP_M) + \frac{(OC_{PSS})_{UR}}{B_{PSS}} (GP_{PS})$$

Providence:

$$GP_{UR} = \left(\frac{\$614,794}{\$22,676,994}\right)(\$58,085,720) + \left(\frac{\$908,699}{\$36,597,670}\right)(\$36,319,580)$$

$$GP_{UR} = \$\$2,476,551$$

Rhode Island excluding Providence:

$$GP_{UR} = \frac{(OC_{MS})_{UR}}{\sum_{i=1}^{38} B_{MSi}} \sum_{i=1}^{38} GP_{Mi} + \frac{(OC_{PSS})_{UR}}{\sum_{i=1}^{38} P_{PSSi}} \sum_{i=1}^{38} GP_{PSi}$$

$$GP_{UR} = \$1,333,117$$

$i = 1, 2...., 38$ = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

$(OC_{MS})_{UR}$ = operating cost of government-provided municipal services allocable to University-related influences (see Model G-4.1)

P_{MS} = regional budget for municipal services (see Model G-4.1)

GP_M = value of all regional government property excluding public school property (source: for Providence--Annual Financial Report of the City of Providence, Rhode Island for the Fiscal Year Ending June 30, 1978, p. 111; for Rhode Island excluding Providence--see Appendix B, page 125)

$(OC_{PSS})_{UR}$ = operating cost of regional public schools allocable to University-related influences (see Model G-4.2)

B_{PSS} = regional budget for public school services (see Model G-4.2)

GP_{PS} = value of all regional government property associated with public schools (source: for Providence--the same as for GP_M above; for Rhode Island excluding Providence--see Appendix B, p. 125)

Note: Variables to the i^{th} degree have been summed over 38 cities and towns in Rhode Island excluding Providence)

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Property Taxes Foregone Through the Tax-Exempt Status of the University

Model G-6 estimates the value of revenues lost to regional governments through the tax-exempt status of the University and through the property tax exemption of $10,000 or less available to Brown University professors appointed prior to July 1, 1966. There are several ways to calculate the value of property taxes that would be collected from University property if the University did not exist. In this model, it is assumed that the assessed value of the land would be similar to that of other land in the contiguous area.

The results for Model G-6 for Providence are obtained by first multiplying the ratio of the University's geographical area to the City's geographical area by the total real estate taxes paid to Providence. This yields the value of taxes for University property. Subtracting the real estate taxes paid by Brown through Farview Inc. from that total and adding this value to the amount of property taxes exempted by University professors results in property taxes foregone by the City of Providence due to the presence of the University.

Model G-6 for the 38 other cities and towns in Rhode Island excluding Providence consists of the total property taxes exempted by Brown professors living in each city. Model G-6 is stated twice.

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Model G-6

$(RF_{RE})_U$

Property Taxes Foregone Through the Tax-Exempt Status of the University

Providence:

$$(RF_{RE})_U = (R_{RE})(\frac{G_U}{G_P}) - (R_{RE})_U + BP_E$$

$$(RF_{RE})_U = (\$57,416,207)(\frac{0.23}{18.1}) - \$37,646 + \$22,223$$

$$(RF_{RE})_U = \$714,175$$

Rhode Island excluding Providence:

$$(RE_{RE})_U = \mathop{}\limits_{i=1}^{38} BP_{Ei}$$

$$(RE_{RE})_U = \$12,394$$

i = 1, 2...., 38 = cities and towns in Rhode Island excluding Providence (see Model G-1.1.1)

Variable Description:

R_{RE} = total property taxes collected in the City of Providence during the fiscal year ending June 30, 1977 (source: Annual State Report on Local Government Finances and Tax Equalization, State Department of Community Affairs, 1978, p. 75)

G_U = geographical area of Brown University (source: Carol Wooten, Physical Planner, Brown University)

G_P = geographical area of the City of Providence (source: Journal-Bulletin Rhode Island Almanac, 1979, p. 26)

$(R_{RE})_U$ = real estate taxes paid by the University to the City of Providence through Farview, Inc. (see Model G-1.1)

BP_{Ei} = total exemptions computed by multiplying the assessed valuation of the exemption taken by Brown University professors by the city or town tax rate in the i^{th} region (source: the same as for R_{RE} above, pp. 114, 118)

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Individual Models

The third and last sector of the community influenced by the presence of the University is the individual. The three models which estimate the impacts of the University on the individual result in values which, unlike the values emerging from many of the previous models, are not additive. In addition, these models differ in that they depend upon information obtained by both the business and government sector models.

Number of Regional Jobs Attributable to the Presence of the University

Model I-1 estimates the total number of jobs in Rhode Island attributable to the presence of the University by adding the jobs provided directly to those created indirectly by the University. The jobs created indirectly are calculated by first adding the value of city-provided municipal services and public school services to total University-related expenditures. The resulting value is then multiplied by the number of full-time jobs per dollar of direct expenditures (j). In computing the jobs created in Providence, this figure is then added to the number of faculty and staff positions to yield the total number of jobs attributable to the presence of the University in Providence.

* * * * * * * * * * * *

Model I-1

J_R

Number of Jobs in the Region Attributable to the Presence of the University

Providence:

$$J_R = \overset{\overline{+}}{F} + (j) \quad (E_R)_{UR} + (OC_S)_{UR}$$

$$J_R = 2,229 + (0.00008)(\$32,360,686 + \$1,523,493)$$

$$J_R = 4,940$$

Rhode Island excluding Providence:

$$J_R = (j) \quad (E_R)_{UR} + (OC_S)_{UR}$$

$$J_R = (0.00007)(\$19,225,086 + \$1,105,947)$$

$$J_R = 1,423$$

Variable Description:

F = total number of faculty and staff position (see Table 12)

j = full-time jobs per dollar of direct expenditures (see Appendix C)

$(E_R)_{UR}$ = University-related regional expenditures (Model B-1.1)

$(OC_S)_{UR}$ = operating cost of local government-provided municipal and public school services allocable to University-related influences (Model G-4)

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Personal Income of Regional Individuals from University-related Jobs and Business Activities

Model I-2 estimates the total personal income of local and state individuals from University-related jobs and business activities. It considers two types of personal income. First is the income received by University employees who reside in Providence. This figure is obtained by multiplying the proportion of faculty and staff who reside locally by the gross compensation of all faculty and staff.

The second type of personal income is the income related to non-University jobs attributable to the presence of the University. This figure is obtained by multiplying University-related expenditures (from Model B-1.1) by the Providence figure for payrolls and profits per dollar of direct expenditure in Providence (p).

The above procedure is repeated for the State, excluding Providence, substituting the appropriate values.

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Model I-2

PI_{UR}

Personal Income of Regional Individuals from University-Related Jobs and Business Activities

$$PI_{UR} = (f_R)(W_F) + (p)(E_R)_{UR}$$

Providence:

$$PI_{UR} = (0.524)(\$24,949,790) + (0.58)(\$32,360,686)$$

$$PI_{UR} = \$31,842,888$$

Rhode Island excluding Providence:

$$PI_{UR} = (0.404)(\$24,949,790) + (0.50)(\$19,225,086)$$

$$PI_{UR} = \$19,692,258$$

Variable Description:

f_R = proportion of faculty and staff residing locally and in the remainder of the State (see Model B-1.1.2.1)

W_F = gross compensation to faculty and staff (source: Brown University Controller's Office printout for fiscal 78)

p = payrolls and profits per dollar of regional direct expenditures (see Appendix C)

$(E_R)_{UR}$ = University-related regional expenditures (Model B-1.1)

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Durable Goods Procured with Income from University-Related Jobs and Business Activities

The final model, I-3, estimates the dollar value of durable goods procured with income from University-related jobs and business activities. Durable goods are items such as cars, appliances and furniture. To calculate this model, the personal income of regional individuals from University-related jobs and business activities (derived in Model I-2) is multiplied by the proportion of total income typically used to purchase durable goods (i). A national figure was used for the variable i, as a local proportion was unobtainable.

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Model I-3

DG_{UR}

Durable Goods Procured with Income from University-Related Jobs and Business Activities

$$DG_{UR} = (i)(PI_{UR})$$

Providence:

$DG_{UR} = (0.086)(\$31,842,888)$

$DG_{UR} = \$2,738,488$

Rhode Island excluding Providence:

$DG_{UR} = (0.086)(\$19,692,258)$

$DG_{UR} = \$1,693,534$

Variable Description:

i = proportion of total income typically used to purchase durable goods (see Appendix B, page 126)

(PI_{UR}) = personal income of local individuals from University-related jobs and business activities (Model I-2)

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APPENDIX A

INCOME AND EXPENDITURE SURVEY

INCOME AND EXPENDITURE SURVEY

In February, 1976, a survey was made to determine the amount and kind of expenditures made in Providence and in the State of Rhode Island by personnel and students of the University. A questionnaire was sent to the entire population of the faculty, staff and graduate students and to 50% of the undergraduates.

Surveys sent to subgroups--appointed, non-appointed, weekly-paid personnel, graduate students and undergraduates--were differentiated by color-coded sheets. It was requested that in the case where more than one person in a household was associated with the University, only one survey be completed.

Lists of employees and students were obtained from computer listings of personnel and student data files supplied by Administrative Data Processing. The total number of University households was adjusted to compensate for instances where more than one person in a household was associated with the University or where a person was listed more than once in the files.

The resulting information was coded and computerized for analysis. The sample sizes and response rates are shown in Table 11.

The surveys sent to appointed and non-appointed staff are identical. The weekly-paid staff survey differed on the question relating to income where it was expressed in terms of a weekly rather than annual income. Also, the question asking whether one's residence in the Rhode Island area is a result of employment by Brown was omitted from the weekly-paid survey. The undergraduate and graduate student are essentially identical.

A summary of the survey results is available upon request.

The results of the survey have been used in 1979 as a basis for determining many of the variables used in the models.

TABLE 11

INCOME AND EXPENDITURE SURVEY RESPONSE RATES

	% of Population Sampled	Number Surveys Mailed	Adjusted Number University Households	Number Surveys Returned	Response Rate
Faculty and Staff					
Weekly-paid	100%	384	376	57	15%
Non-appointed	100	732	707	284	40
Appointed	100	1,043	964	579	60
Total		2,159	2,047	920	45%
Students					
Freshmen	. . .	. . .	. . .	280	. . .
Sophomores	. . .	. . .	. . .	226	. . .
Juniors	. . .	. . .	. . .	231	. . .
Seniors	. . .	. . .	. . .	293	. . .
Total undergrads	50%	2,456	2,456	1,030	42%
Graduate	. . .	. . .	. . .	459	. . .
Medical	. . .	. . .	. . .	68	. . .
Total Grad Students	100%	1,424	1,416	527	37%
Total Undergraduate and Graduate Students		3,880	3,872	1,557	40%

BROWN UNIVERSITY
PROVIDENCE, R.I. 02912

THE PRESIDENT

February 4, 1976

To all members of the Brown Community:

The University is beginning an intensive study of its impact on the City of Providence and the State of Rhode Island and I am writing to ask your full cooperation to make this important analysis a success.

While Brown has never before undertaken a thorough study of this type, it is essential that we have an ongoing knowledge of the University's impact--economic and otherwise--on the City and the State.

The Brown impact study will follow guidelines suggested by the American Council on Education. We have investigated the results of similar studies conducted by Johns Hopkins University, the University of Rhode Island, the Cambridge/Boston educational institutions, and other colleges and universities so that we may profit from their experiences. These institutions have found their results invaluable.

For our study to be complete, we hope to identify all direct and indirect effects of an institution the size and scope of Brown. There is some information we can develop from our own resources; in other cases, especially where we try to assess the indirect effects of the University and its faculty, students and employees, we are asking what I know are sensitive questions. It is here that I do ask for your help, because there is no other feasible way for us to accumulate these kinds of data.

As you will note on the enclosed questionnaire, there is no place for your name or any other information to identify you so that the answers you provide are given in complete anonymity. They are to be used, along with other data, for this study alone. The single deviation in standardizing the survey has been to enable us to study more thoroughly the impact of such obvious subgroups as appointed personnel, nonappointed personnel, weekly-paid personnel, graduate students and undergraduates.

We are distributing this questionnaire at this time because W-2 forms are being mailed and can prove helpful in answering the questions. In case both you and your spouse are associated with Brown, we ask that only one survey reflect the two of you.

I am grateful for your cooperation and ask that you return the survey in the attached envelope as promptly as possible so that we may move forward with our study on the basis of a valid sampling of the Brown community. We hope you can provide us with a returned questionnaire no later than February 16. The Office of Institutional Research (Box 1912) will receive and correlate all information and Carol Wooten in that office will answer any questions you may have.

Thank you for your help.

Sincerely yours,

Donald F. Hornig

Donald F. Hornig

APPOINTED AND NON-APPOINTED EMPLOYEE QUESTIONNAIRE

1. What is your marital status?

☐ Single, Widowed, Divorced, Separated

☐ Married

2. How many children do you have? ________

☐ How many of these children attend public school in Rhode Island?

☐ How many of these children attend private school in Rhode Island?

3. Where is your residence?

☐ In Providence

☐ In Rhode Island (excluding Providence)

☐ Other. Please specify state ____________________

4. Is your residence in the Rhode Island area a result of your employment by Brown University?

☐ Yes

☐ No

5. A. What type of housing most closely describes yours?

☐ University housing

☐ Rental

☐ Own your own home

☐ Live with parents

B. What is your average monthly payment for housing? (Include utilities and household insurance. Exclude taxes.)

☐ $99 or less

☐ $100--$199

☐ $200--$299

☐ $300--$399

☐ $400--$499

☐ $500 or more

☐ No payment

6. How many hours of volunteer work in Rhode Island do you do per month?

_______ Your volunteer hours

_______ Volunteer hours of other members of your immediate family

7. What is the total annual income of all related persons who live in your home? (Include interest, dividends, etc.)

A. Before withholding		B. After withholding
☐	(1) Below $5000	☐
☐	(2) $5000--$7499	☐
☐	(3) $7500--$9999	☐
☐	(4) $10,000--$12,999	☐
☐	(5) $13,000--$15,999	☐
☐	(6) $16,000--$18,999	☐
☐	(7) $19,000--$24,999	☐
☐	(8) $25,000--$29,999	☐
☐	(9) $30,000--$39,999	☐
☐	(10) $40,000--$59,999	☐
☐	(11) $60,000 and above	☐

8. What percentage of the amount checked in 7B (above) do you estimate is spent within the following areas? (It might help to consult your checkbook. Do not include housing expenses listed in #5B, or personal property and income taxes.)

_______ A. Providence (0%, 10%, 20%,......100%)

_______ B. Rhode Island excluding Providence (0%, 10%, 20%,......100%)

9. What is the average amount of money kept in Rhode Island banks in the following categories for all related persons living in your home? (This question is important to show the influence of Brown personnel on the expansion of the credit bases of local banks.)

A. Checking Account		B. Savings Account (Bank and/or Savings & Loan)
☐	(1) $99 or less	☐
☐	(2) $100--$249	☐
☐	(3) $250--$499	☐
☐	(4) $500--$749	☐
☐	(5) $750--$999	☐
☐	(6) $1000--$2499	☐
☐	(7) $2500--$4999	☐
☐	(8) $5000--$9999	☐
☐	(9) $10,000 or more	☐

10. Are you primarily associated with the Program in Medicine?

☐ Yes

☐ No

WEEKL[illegible]PAID EMPLOYEE QUESTIONNAIRE

1. What is your status at Brown?
   - ☐ Graduate student
   - ☐ Medical student

2. What is your marital status?
   - ☐ Single, Divorced, Separated, Widowed
   - ☐ Married

3. How many children do you have? ______
   - ☐ How many of these children attend public school in Rhode Island?
   - ☐ How many of these children attend private school in Rhode Island?

4. Where is your residence?
   - ☐ On campus (including all University housing)
   - ☐ In Providence
   - ☐ In Rhode Island (excluding Providence)
   - ☐ Other. Please specify state ____________________

5. In what type of housing do you reside?
   - ☐ University Housing (Dormitory, Co-op, Apartment, etc.)
   - ☐ Rental
   - ☐ Own Home
   - ☐ With Parents or Relatives

6. Please estimate the average monthly expenditures of you and your spouse in the following categories:

	Non-University Housing Expenses (Include utilities and insurance; exclude taxes.)	Non-University Food Expenses	All other Non-University Expenses
1) $49 or less	☐	☐	☐
2) $50--$99	☐	☐	☐
3) $100--$199	☐	☐	☐
4) $200--$399	☐	☐	☐
5) $400 or more	☐	☐	☐
6) No payment	☐	☐	☐

7. How many hours of volunteer work in Rhode Island do you do per month?

   ______ Your volunteer hours

   ______ Volunteer hours of other members of your immediate family

6. What is the total weekly income of all related persons who live in your home? (Include interest, dividends, etc.)

A. Before withholding		B. After withholding
☐	(1) $49 or less	☐
☐	(2) $50 to $99	☐
☐	(3) $100 to $149	☐
☐	(4) $150 to $199	☐
☐	(5) $200 to $249	☐
☐	(6) $250 to $499	☐
☐	(7) $500 or above	☐

7. What percentage of the amount checked in 6B (above) do you estimate is spent within the following areas? (It might help to consult your checkbook. Do not include housing expenses listed in #4B, or personal property and income taxes.)

______ Providence (0%, 10%, 20%......100%)

______ Rhode Island--excluding Providence (0%, 10%, 20%......100%)

8. What is the average amount of money kept in Rhode Island banks in the following categories for all related persons living in your home? (This question is important to show the influence of Brown personnel on the expansion of the credit bases of local banks.)

A. Checking Account		B. Savings Account (Bank and/or Savings & Loan)
☐	(1) $99 or less	☐
☐	(2) $100--$249	☐
☐	(3) $250--$499	☐
☐	(4) $500--$749	☐
☐	(5) $750--$999	☐
☐	(6) $1000--$2499	☐
☐	(7) $2500--$4999	☐
☐	(8) $5000--$9999	☐
☐	(9) $10,000 or more	☐

9. Are you primarily associated with the Program in Medicine?

☐ Yes

☐ No

GRADUATE STUDENT QUESTIONNAIRE

1. What is your marital status?

☐ Single, Widowed, Divorced, Separated

☐ Married

2. How many children do you have? ______

☐ How many of these children attend public school in Rhode Island?

☐ How many of these children attend private school in Rhode Island?

3. Where is your residence?

☐ In Providence

☐ In Rhode Island (excluding Providence)

☐ Other. Please specify state ______________

4. Is your residence in the Rhode Island area a result of your employment by Brown University?

☐ Yes

☐ No

5. A. What type of housing most closely describes yours?

☐ University housing

☐ Rental

☐ Own your own home

☐ Live with parents

B. What is your average monthly payment for housing? (Include utilities and household insurance. Exclude taxes.)

☐ $99 or less

☐ $100--$199

☐ $200--$299

☐ $300--$399

☐ $400--$499

☐ $500 or more

☐ No payment

8. What is the total annual income of you and your spouse? (Include interest, dividends, etc.)

A. Before withholding		B. After withholding
☐	$999 or less	☐
☐	$1000--$2999	☐
☐	$3000--$4999	☐
☐	$5000--$6999	☐
☐	$7000--$9999	☐
☐	$10,000--$14,999	☐
☐	$15,000 or more	☐

9. What is the approximate monthly expenditure of you and your spouse within the following areas exclusive of University facilities? Include all non-housing expenses. (It might help to consult your checkbook.)

A. In Providence		B. In Rhode Island (excluding Providence)
☐	$49 or less	☐
☐	$50--$99	☐
☐	$100--$199	☐
☐	$200--$299	☐
☐	$300--$399	☐
☐	$400--$499	☐
☐	$500--$749	☐
☐	$750 or more	☐

10. What is the average amount of money that you and your spouse keep in Rhode Island banks in the following categories? (This question is important to show the influence of Brown students and their families on the expansion of credit bases of local banks.)

A. Checking Account		B. Savings Account (Bank and/or Savings and Loan)
☐	$49 or less	☐
☐	$50--$99	☐
☐	$100--$199	☐
☐	$200--$299	☐
☐	$300--$499	☐
☐	$500--$749	☐
☐	$750--$999	☐
☐	$1000--$2499	☐
☐	$2500--$4999	☐
☐	$5000--$9999	☐
☐	$10,000 or more	☐

11. Do you have a fellowship or loan from Brown University?
☐ Yes
☐ No

12. Are you employed by Brown University?
☐ Yes
☐ No

13. Do your parents reside in Rhode Island?
☐ Yes
☐ No

UNDERGRADUATE STUDENT QUESTIONNAIRE

1. What is your status at Brown?
   - ☐ Freshman
   - ☐ Sophomore
   - ☐ Junior
   - ☐ Senior

2. Where is your residence?
   - ☐ On campus (including all University housing)
   - ☐ In Providence
   - ☐ In Rhode Island (excluding Providence)
   - ☐ Other. Please specify state ______________

3. In what type of housing do you reside?
   - ☐ University Housing (Dormitory, Co-op, Apartment, etc.)
   - ☐ Rental
   - ☐ Own Home
   - ☐ With Parents or Relatives

4. Please estimate your average monthly expenditures in the following categories:

	Non-University Housing Expenses (Include utilities.)	Non-University Food Expenses	All other Non-University Expenses
1) $49 or less	☐	☐	☐
2) $50--$99	☐	☐	☐
3) $100--$199	☐	☐	☐
4) $200--$399	☐	☐	☐
5) $400 or more	☐	☐	☐
6) No payment	☐	☐	☐

5. How many hours of volunteer work in Rhode Island do you do per month?

   _______ Your volunteer hours

   _______ Volunteer hours of other members of your immediate family

6. What is the total annual income of you and your spouse? Include allowances, interest, dividends, etc.

A. Before withholding		B. After withholding
☐	$999 or less	☐
☐	$1000--$2999	☐
☐	$3000--$4999	☐
☐	$5000--$6999	☐
☐	$7000--$9999	☐
☐	$10,000 or more	☐

7. Please estimate the approximate monthly expenditure of you and your spouse within the following areas exclusive of University facilities. Include all non-housing expenses. (It might help to consult your checkbook.)

A. In Providence		B. In Rhode Island (excluding Providence)
☐	$49 or less	☐
☐	$50--$99	☐
☐	$100--$199	☐
☐	$200--$299	☐
☐	$300--$399	☐
☐	$400 or more	☐

8. What is the average amount of money that you and your spouse keep in Rhode Island banks in the following categories? (This question is important to show the influence of Brown students and their families on the expansion of credit bases of local banks.)

A. Checking Account		B. Savings Account (Bank and/or Savings & Loan)
☐	$49 or less	☐
☐	$50--$99	☐
☐	$100--$199	☐
☐	$200--$299	☐
☐	$300--$499	☐
☐	$500--$749	☐
☐	$750--$999	☐
☐	$1000 or more	☐

9. Do you receive financial aid from Brown University?
   - ☐ Yes
   - ☐ No

10. Are you employed by Brown University?
   - ☐ Yes
   - ☐ No

11. Do your parents reside in Rhode Island?
   - ☐ Yes
   - ☐ No

12. What is your marital status?
   - ☐ Single, Divorced, Separated
   - ☐ Married

13. How many children do you have? ______
   - ☐ How many of these children attend public school in Rhode Island?
   - ☐ How many of these children attend private school in Rhode Island?

APPENDIX B

NOTES ON CALCULATIONS AND TABULATED DATA

TABLE 12

FACULTY AND STAFF RESIDENCY PATTERNS

	Weekly-Paid	Non-Appointed	Appointed	Total
Place of Residence	No. Household	No. Household	No. Household	No. Household
Rhode Island				
Barrington	6	24	84	114
Cranston	13	44	20	77
East Providence	55	84	72	211
Pawtucket	30	40	13	83
Warwick	12	39	29	80
Remaining Towns	48	152	94	294
Total	164	383	312	859
Providence	148	320	678	1,146
Total R.I.	312	703	990	2,005
Out of State				
Massachusetts	24	40	70	134
Connecticut	0	2	7	9
Other states	0	3	13	16
Total Out of State	24	45	90	159
Grand Total	336	748	1,080	2,164

1978 estimated numbers of households were derived from the 1976 study's Proportion of households to persons within each category; the appropriate proportion was applied to numbers employed in each category. Figures given may be mis-stated because the Personnel/Payroll file has been changed since 1976 and some jobs have been assigned to different categories.

TABLE 13

PROPORTION OF BROWN EMPLOYEES RESIDING IN THE REGION

Employee Category	Proportion in Providence (f_R)	Proportion in R.I. excluding Providence (f_R)
Weekly-paid	.439	.489
Non-exempt	.427	.512
Exempt	.628	.289
Total	.524	.403

SOURCE: 1976 Economic Impact Study, p. 100

TABLE 14

ESTIMATED PROPORTION OF BROWN EMPLOYEES WHO RENT HOUSING IN THE REGION

	Proportion of Renters In Providence (f_H)	Proportion of Renters In Rhode Island, Excluding Providence (f_H)
Employee Category	Propor. Renters (f_H)	Propor. Renters (f_H)
Weekly-paid	.609	.250
Non-exempt	.719	.280
Exempt	.464	.134
Total	.533	.204

SOURCE: 1976 Economic Impact Study, p. 101

TABLE 15

DISPOSABLE HOUSEHOLD INCOME OF BROWN EMPLOYEES

Employee Category	Estimated Disposable Household Income (DI_f)	Average (Mean) Disposable Household Income	Total Number of Employee Households
Weekly-paid	$ 4,540,534	$13,513	336
Non-exempt	9,629,493	12,874	748
Exempt	21,442,004	19,854	1,080
Total	$35,612,031		

Based on 1976 proportions of gross compensation (Controller's printout) to estimated total disposable household income (survey) and of estimated disposable household income per category to total disposable household income.

TABLE 16

PROPORTION OF A RENTER'S EXPENDITURES SPENT ON HOUSING

Employee Category	Proportion Spent on Housing (e_H)
Weekly-paid	.252
Non-exempt	.271
Exempt	.216
Total	.240

SOURCE: 1976 Economic Impact Study

TABLE 17

FACULTY AND STAFF NON-HOUSING EXPENDITURES IN THE REGION

Employee Category	Estimated number of Households	Expenditures in Providence		Expenditures in Rhode Island Excluding Providence	
		Estimated Average per Household	Projected Total	Estimated Average per Household	Projected Total
Providence Residents					
Weekly	147	4,897	719,859	4,158	611,226
Non-exempt	320	5,208	1,666,560	2,164	692,480
Exempt	678	9,859	6,684,402	2,885	1,956,030
Total			9,070,837 $(E_{NH})_{pF}$		3,259,736 $(E_{NH})_{pF}$
R.I. Residents Excluding Providence					
Weekly	164	2,807	460,348	7,386	1,211,304
Non-exempt	383	2,343	897,369	8,004	3,065,532
Exempt	312	4,249	1,325,688	10,834	3,380,208
Total			2,683,405 $(E_{NH})_{RIF}$		7,657,044 $(E_{NH})_{RIF}$
Non-State Residents					
Weekly	24	2,686	64,464	3,993	95,832
Non-exempt	45	3,853	173,385	3,433	154,485
Exempt	89	2,244	199,716	2,482	220,898
Total			437,565 $(E_{NH})_{NSF}$		471,215 $(E_{NH})_{NSF}$

SOURCE: Based on proportions of expenditures to Disposable Household income derived from 1976 Impact Study.

TABLE 18

BROWN UNIVERSITY GRADUATE STUDENT RESIDENCY PATTERNS

Place of Residence	Number of Graduate Students	Number of Households
Rhode Island		
Barrington	10	10
Cranston	14	14
East Providence	16	15
Pawtucket	21	21
Warwick	14	14
Remaining Towns	82	82
Total	157	156
Providence	1,019	1,012
Total Rhode Island	1,176	1,168
Out of State		
Massachusetts	114	114
Connecticut	18	18
Other States	69	69
Total Out of State	201	201
Grand Total	1,377	1,369

SOURCE: Brown University Student Directory, 1977-78. Graduate Students having no listed address were distributed among the cities and towns in proportion to those with known addresses.

TABLE 19

BROWN UNIVERSITY STUDENT HOUSING PATTERNS

Place of Residence	Graduate Students Estimated Number of Households	Undergraduate Students Estimated Number of Households
Providence		
On-campus University rentals	250*	4,347*
Rental (non-University	731	605
Own	19	10
Live with Parents	7	63*
Total	1,007	5,025
Rhode Island Excluding Providence		
Rental	91	25
Own	42	5
Live with Parents	25	52*
Total	158	82
Outside State		
Rent or own	119	5
Live with Parents	15	20*
Total	134	25
Grand Total	1,368*	5,132*

*Figures obtained from Housing Office, 1977 University Catalogue and 1977-78 student directory.

All other figures based on proportions derived from 1976 Impact Study, p. 106.

TABLE 20

NON-UNIVERSITY EXPENDITURES IN THE REGION BY STUDENTS LIVING IN UNIVERSITY HOUSING OR WITH PARENTS

Student Category	Average Miscellaneous Expenditures* Per Student $(E_M)_S$	Estimated Number of Students from Table 19		
		In University Housing	Living With Parents	Total $(S_{UH,P})$
Undergraduates	$886	4,347	135	4,482
Graduate	$2,013	250	55	213

*Average expenditures: 1976 Study figures adjusted by Consumer Price Index (all items)

i.e. $(E_M)_S\ 1979 = (E_M)_S\ 1975 \times \frac{\text{CPI 1979}}{\text{CPI 1975}}$

TABLE 21

REGIONAL EXPENDITURES BY STUDENTS

21A. Annual Non-Housing Expenditures

Student Category	Average Non-Brown Food and Misc. Expend. (1) $(E_{nh})_S$	Providence	Rhode Island Excluding Providence
		Proportion of Total (e_R)	Proportion of Total (e_R)
Graduate	$3,007	.699	.275
Undergraduate	$ 951	.699	.298

21B. Annual Rental Expenditures (non-Brown)

Student Category	Average Rental Expense Per Student $(E_h)_S$ (2)	Estimated Renters from Table 19	
		In Providence	In Rhode Island Excluding Providence
Graduate	2,425	823	91
Undergraduate	1,179	776	25

(1) Average expenditures: 1976 study figures adjusted by Consumer Price Index - all items

i.e. $(E_{nh})S\ 1979 = (E_{nh})S\ 1975 \cdot \frac{\text{CPI } 1979}{\text{CPI } 1975}$

(2) Average rental expenses: 1976 study figures adjusted by Consumer Price Index - housing

i.e. $(E_h)S\ 1979 = (E_h)S\ 1975 \quad \frac{\text{CPI}_h\ 1979}{\text{CPI}_h\ 1975}$

TABLE 22

REGIONAL EXPENDITURES BY NON-PROVIDENCE STUDENTS

22A. Expenditures in Providence by Non-local students

Student Category	Average Per Student $(E_r)_{NLS}$ (1)	Projected Number of Students	
		Rhode Island Excluding Providence (S_{RI})	Non-State (S_{NS})
Graduate	$916	133	119
Undergraduate	$596	30	5

22B. Expenditures in Rhode Island, Excluding Providence, by Non-state Students

Student Category	Average Per Student (1) $(E_r)_{NSS}$	Projected Student Total (S_{NS})
Graduate	$423	119
Undergraduate	$272	5

(1) Average expenditures: 1976 study figures adjusted by Consumer Price Index - all items

Market Value of Real Business Property

A direct statement of the dollar value of capital facilities in the business community was not obtainable. Thus, it was necessary to use assessed valuation of property in order to obtain a market value. A division between business property and residential property also was unavailable, therefore the assessed valuation of business real estate was calculated by applying the percent of residential property to the total real estate assessed valuation, then this amount was subtracted out.[1] This step was calculated for each of the 39 cities and towns of Rhode Island.

To convert assessed value to market value, each city or town's assessed real estate valuation obtained above was divided by its average ratio of assessment (percent of full value or amv).[2] The most recent amv values obtainable (1977) were used.

When applied to the Model B-2.1 for estimation of the value of business real property committed to University-related business in the State (excluding Providence), the market value of real business property for each city and town were summed and multiplied by the University's proportion of the State's business volume (see page 112).

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[1] From R. I. Department of Community Affairs, Annual State Report on Local Government Finances and Tax Equalization, 1978, pp. 112 and 114.

[2] Ibid., p. 113

As an example, the market value of business real property for the City of Providence was computed as follows:

1978 Total assessed property valuation = \$1,290,930,930[1]

1978 Total assessed real estate valuation = \$985,802,490

Percent of total assessed property valuation that is residential (1977 Tax Roll)[2] = 42.86%

amv (1977)[3] = 65.64%

Market value of real business property in Providence = MV_B

$$MV_B = \frac{\$985{,}802{,}490 - [(\$1{,}290{,}930{,}930)(.4286)]}{.6564}$$

$$MV_B = \frac{\$432{,}509{,}493}{.6564}$$

$$MV_B = \$658{,}911{,}476$$

---

[1] From R. I. Department of Community Affairs, *Annual State Report on Local Government Finances and Tax Equalization*, 1978, pp. 114-115

[2] *Ibid*., p. 112

[3] *Ibid*., p. 113

Regional Business Volume

The business volume of Providence[1] was estimated by first obtaining the sum of the dollar volume of retail, wholesale, and selected service trades. As the most recent figures available were for 1972, this sum was then weighed by the ratio of the 1978 Providence sales tax receipts to the 1972 receipts to make the figure more representative of current conditions.

1972 Retail Sales = $ 355,351,000
1972 Wholesale Sales = $ 912,005,000
1972 Selected Service Industries = $ 155,986,000
Total Providence Business Volume = $1,423,342,000

$$BV_R = \begin{matrix}\text{1978 Providence}\\ \text{Business Volume}\end{matrix} = \begin{matrix}\text{1972 Providence}\\ \text{Business Volume}\end{matrix} \times \frac{\text{1978 Prov. Sales Tax Receipts}^{2}}{\text{1972 Prov. Sales Tax Receipts}^{3}}$$

$$BV_R = \$1{,}423{,}342{,}000 \times \frac{\$406{,}311{,}000}{\$542{,}928{,}360}$$

$$BV_R = \$1{,}065{,}185{,}675$$

---

[1] The business volume figures for Providence are from the following publications:

1972 Retail Trade--Area Statistics of Rhode Island Cities and Towns, U.S. Census of Business, 1975, p. 40-22.

1972 Wholesale Trade--Area Statistics of Rhode Island Cities and Towns, U.S. Census of Business, 1975, p. 40-11.

1972 Selected Service Industries--Area Statistics of Rhode Island Cities and Towns, U.S. Census of Business, 1975, p. 40-20.

[2] 1978 Sales Tax figures are from the Division of Information Processing, Department of Administration, R. I. Department of Economic Development, Research Division, April, 1979.

[3] 1972 Sales Tax figures are from the Economic Impact Study, 1976, p. 112.

The business volume for the State of Rhode Island was calculated in the same manner using total figures for the State. The Providence business volume was then subtracted from this total to give the business volume of Rhode Island excluding Providence.[1]

1972 Retail Sales = $2,018,227,000
1972 Wholesale Sales = $2,072,100,000
1972 Selected Service Industries = $ 357,229,000
Total Rhode Island Business Volume = $4,447,556,000

$$BV_S = \begin{matrix}\text{1978 Rhode Island}\\ \text{Business Volume}\end{matrix} = \begin{matrix}\text{1972 Rhode Island}\\ \text{Business Volume}\end{matrix} \times \frac{\text{1978 RI Sales Tax Receipts}^2}{\text{1972 RI Sales Tax Receipts}^3}$$

$$BV_S = \$4,447,556,000 \times \frac{\$2,316,582,000}{\$1,899,693,020}$$

$$BV_S = \$5,423,575,317$$

$$BV_S \text{ excluding Providence} = \$5,423,575,317 - \$1,065,185,675$$
$$= \$4,358,389,642$$

---

[1] The business volume figures for Rhode Island are from Rhode Island Basic Economic Statistics .... the Economy, Summary and Trends, Rhode Island Department of Economic Development, 1975, p. 81.

[2] 1978 Sales Tax figures are from the Division of Information Processing, Department of Administration, R.I. Department of Economic Development, Research Division (dated April, 1979).

[3] 1972 Sales Tax figures are from the Economic Impact Study, 1976, p. 113.

Inventory-to-Business-Volume Ratio

The inventory-to-business-volume ratio was computed from information in the Statistics of Income, Corporation Income Tax Returns, 1978.[1] Local and State ibv are assumed to be equal. Firms engaged in agriculture, mining, finance, insurance, and real estate are excluded because asset structure tends to overstate desired statistics.

(in thousands of dollars)

Total Inventory = $ 262,566,242
Adjusted Inventory = $ 255,484,323
Total Business Receipts = $2,361,381,928
Adjusted Business Receipts = $2,180,573,933

$$\text{ibv} = \frac{\$\ 255{,}484{,}323}{\$2{,}180{,}573{,}933}$$

$$\text{ibv} = 0.117$$

---

[1] pp. 14, 19

TABLE 23

FACULTY, STAFF AND STUDENT AVERAGE TIME AND DEMAND DEPOSITS IN RHODE ISLAND BANKS

	Number of Households	Time Deposits		Demand Deposits	
		Average	Total	Average	Total
Faculty and Staff					
Employee Category	F	TD_f	TD_F	DD_f	DD_F
Weekly-paid	336	$2,857	$ 959,952	$233	$ 78,288
Non-appointed	748	3,233	2,418,284	489	365,772
Appointed	1,080	4,425	4,779,000	917	990,360
Total	2,164		$8,157,236		$1,434,420
Students					
Student Category	S	TD_s	TS_S	DD_s	DD_S
Graduate	1,368	$ 974	$1,332,432	$238	$ 325,584
Undergraduate	5,132	162	831,384	125	641,500
Total	6,500		$2,163,816		$ 967,084

SOURCE: University Deposits--Brown University Deputy Treasurer. The data, obtained from the 1976 questionnaires, refer to average deposits in Rhode Island banks only. The average amount of deposit was held at the 1976 figure because there is no new information and because of uncertainty concerning the effects of inflation on bank accounts.

Cash-to-Business-Volume Ratio

The cash-to-business-volume ratio was computed from information in the Statistics of Income, Corporation Income Tax Returns, 1973.[1] As was true in computing ibv (see page 114), firms engaged in agriculture, mining, finance, insurance, and real estate are excluded because asset structure tends to overstate desired statistics.

(in thousands of dollars)

Total Cash = $ 258,711,569
Adjusted Cash = $ 63,640,898
Total Business Receipts = $2,361,381,928
Adjusted Business Receipts = $2,180,573,933

$$\text{cbv} = \frac{\$\ 63{,}640{,}898}{\$2{,}180{,}573{,}933}$$

$$\text{cbv} = .0292$$

---

[1] pp. 14, 19.

TABLE 24

ESTIMATED PROPORTION OF BROWN EMPLOYEES WHO OWN HOMES IN THE REGION

Employee Category	In Providence	In Rhode Island Excluding Providence
	Proportion of Owners (f_o)	Proportion of Owners (f_o)
Weekly-paid	.304	.679
Non-exempt	.215	.583
Exempt	.477	.817
Total	.404	.710

SOURCE: Economic Impact Study, 1976, p. 117.

Assessed Value of Real Private Property

As stated in Appendix B (page 110), a division between the assessed value of business and private residential property was not available. However, the percent of real property that was residential was known, and by applying this percent to assessed real property valuations on a city-by-city basis, real residential assessed valuations were calculated.

The source of the assessed real property valuations and the percent of residential real property was the Rhode Island Department of Community Affairs' Annual State Report on Local Government Finances and Tax Equalization, pages 114 and 112, respectively.

TABLE 25

ESTIMATED HOUSEHOLD SIZES

Region	Number of Staff Households in Region	Total Number in Staff Households in Region FH_R	Average Household Size
Barrington	114	369	3.24
Cranston	77	249	3.24
East Providence	211	684	3.24
Pawtucket	83	269	3.24
Warwick	80	259	3.24
Remaining Towns	294	952	3.24
Total	859	2,782	3.24
Providence	1,146	3,060	2.67
Total	2,005	5,842	2.92

SOURCE: Table 12, p. 99, and 1976 average household size, Economic Impact Study, p. 119.

TABLE 25--Continued

25B. Student Households

Region and Group	Number of Student Households in Region			Total Number in Student Households in Region SH_R			Average Household Size		
	On Campus	Off Campus	Total	On Campus	Off Campus	Total	On Campus	Off Campus	Total
Providence									
Undergrad	4,347	615	4,962	4,347	701	5,048	1.00	1.14	1.02
Graduate	250	750	1,000	250	1,095	1,345	1.00	1.46	1.36
Total	4,597	1,365	5,962	4,597	1,796	6,393			
Barrington									
Undergrad	7				9			1.23	
Graduate	10				24			2.36	
Cranston									
Undergrad	8				10			1.23	
Graduate	14				33			2.36	
E. Prov.									
Undergrad	5				6			1.23	
Graduate	15				35			2.36	
Pawtucket									
Undergrad	1				1			1.23	
Graduate	21				50			2.36	
Warwick									
Undergrad	4				5			1.23	
Graduate	14				33			2.36	
Remaining Cities & Towns									
Undergard	27				33			....	
Graduate	59				140			....	
Entire State of Rhode Island									
Undergrad	667				765			1.15	
Graduate	883				1,410			1.56	
Total	1,550				2,175				

SOURCE: Table 18; Table 19 adjusted by 1976 proportions derived from 1976 Study, Table 25.

Assessed Value of Motor Vehicles and Tangible and Personal Property

A separate statement of the assessed values of the two types of nonreal or tangible property that are taxed--motor vehicles and tangible and personal property--was not available. However, the percentage of total property that consisted of motor vehicles was available.[1] This percentage for each region was multiplied by the total assessed value of total property[2] in the proper region to produce the assessed value of motor vehicles. The product was then subtracted from the nonreal or tangible property assessed value[3] leaving the assessed value of tangible and personal property in the region.

This procedure was completed for each of the 39 cities and towns in Rhode Island. As an example, the computations for Providence are depicted below:

1978 Total Assessed Property Valuation	$1,290,930,930
1978 Total Assessed Nonreal or Tangible Property Valuation	$287,586,740
% of Total Assessed Valuation that is Motor Vehicles	8.7%

V_{MV} = Assessed Value Motor Vehicles

V_{PP} = Assessed Value Tangible and Personal Property

$$V_{MV} = (.0870)(\$1,290,930,930)$$

$$V_{MV} = \$112,310,991$$

$$V_{PP} = \$287,586,740 - \$112,310,991$$

$$V_{PP} = \$175,275,750$$

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[1] Annual State Report on Local Government Finances and Tax Equalization, State Department of Community Affairs, 1978, p. 112

[2] *Ibid.*, p. 114

[3] *Ibid.*, pp. 114, 115

TABLE 26

NUMBER OF FACULTY, STAFF, AND STUDENT CHILDREN IN PUBLIC SCHOOLS IN RHODE ISLAND

Region and Group	Number of Households in Region	Estimated Number of Public School Children in Region $(CH_{PS})_F$ $(CH_{PS})_S$	Average Number of Public School Children in Household
Providence			
Faculty & Staff	1,146	454	.390
Student	N/A	30	....
Total	1,146	484	....
Barrington			
Faculty & Staff	114	70	.615
Student	10	2	.193
Cranston			
Faculty & Staff	77	47	.615
Student	14	3	.193
E. Providence			
Faculty & Staff	211	130	.615
Student	15	3	.193
Pawtucket			
Faculty & Staff	83	51	.615
Student	21	4	.193
Warwick			
Faculty & Staff	80	49	.615
Student	14	3	.193
Remaining Cities & Towns			
Faculty & Staff	294	181	.615
Student	59	11	.193
Entire State of Rhode Island			
Faculty & Staff	2,005	982	.615
Student	133	56	.193
Total	2,138	1,038	....

SOURCE: Brown University Faculty and Staff and Student Surveys (see Appendix A)

TABLE 27

HOUSEHOLD INCOME BEFORE WITHHOLDING

Group	Estimated Household Income I_F & I_{GS}	Estimated Average (Mean) Income	Total Number of Households
Weekly	$ 5,920,656	$17,621	336
Non-exempt	12,595,572	16,839	748
Exempt	28,797,120	26,664	1,080
Total Faculty & Staff	$47,313,348		
Graduate Students	$ 6,185,700		

SOURCE: 1976 Economic Impact Study figures were adjusted by finding the proportion of Estimated average income to average disposable household income.

TABLE 28

COST OF MUNICIPAL-TYPE SERVICES SELF-PROVIDED BY THE UNIVERSITY

	Cost	Source
Security	$548,978	Brown University Financial Accounting System Report (for FY 1978
Trash Removal	57,540	Internal Records: Physical Plant Office and Office of Business Manager-Residence Services (for FY 1978)
Total	$606,428	

Value of Regional Government Property

The value of government property for all 39 cities and towns in Rhode Island is as follows: $153,000,000 for municipal property (excluding public school property) and $267,000,000 for public school property.[1]

In order to use the above data in Model G-5, the value of government property in the City of Providence[2] was subtracted. This yielded the following values: $110,350,589 for municipal property (excluding public school property) and $233,460,879 for public school property.

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[1] The Economic Impact of the University of Rhode Island, Geoffrey Booth and Jeffrey Jarrett, 1972, pp. 109, 110

[2] Annual Financial Report of the City of Providence, Rhode Island for the Fiscal Year Ending June 30, 1972, p. 119

Proportion of Total Income Typically Used to Purchase Durable Goods

To obtain the proportion of total income spent on the purchase of durable goods (i), the household purchases of cars and other selected durables was divided by the median income of a family. The household expenditure on durable goods was obtained from Consumer Buying Indicators[1] for the year 1972, and the median family income was obtained from Consumer Income[2] also for the year 1972. The calculation of i was as follows:

$$i = \frac{\text{average amount spent on durable goods}}{\text{median family income}}$$

$$i = \frac{\$957}{\$11,116}$$

$$i = \$0.086$$

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[1] U.S. Dept. of Commerce Current Population Reports, Consumer Buying Indicators, January, 1974, p. 24. No new figures available

[2] U.S. Dept. of Commerce Current Population Reports, Consumer Income, December, 1973, p. 1

APPENDIX C

NOTES ON THE MULTIPLIERS

THE "MULTIPLIERS": m_p, m_i, j, p

Multipliers are used to estimate the multiple effect of an initial economic stimulus. For example, a certain percentage of every dollar spent in regional business establishments is returned to residents of the region as income. A portion of this income is then respent in regional business establishments. The same percentage of every dollar is again returned to residents of the region as income, and so on. In the end, regional residents will receive as income some multiple of the original amount received as income. That multiple is a type of multiplier used in the models.

The Caffrey-Isaacs models employ four multipliers. For each of these they offer a range of values from which multipliers suitable to the regions being studied can be chosen. The multipliers, the models in which they are used, the range of values suggested by Caffrey and Isaacs and the values chosen as multipliers for this study are shown in Table 29.

TABLE 29

MULTIPLIER VALUES

Multiplier	Model	Caffrey-Isaacs Range	Brown University Study	
			Providence	Rhode Island excluding Providence
m_p	B-1.2	0.15-0.30	0.23	0.30
m_i	B-1.3	0.60-0.80	0.70	0.80
j	I-1	0.00007-0.00009	0.00008	0.00007
p	I-2	0.50-0.66	0.58	0.50

Multiplier m_p

This multiplier represents the proportion of receipts from regional sources used in turn to purchase goods and services from regional sources. The range of values suggested by Caffrey and Isaacs is $.15 to $.30 per dollar of expenditures. The larger the region, the larger the proportion of expenditures that remains in the regional economy, hence, the larger the multiplier. Providence is a medium-sized city; therefore, a multiplier from the middle of the range of values was chosen to be used in the Providence model. Rhode Island is a large region, however, so the highest value offered was chosen for the multiplier used in the State model.

Multiplier m_i

The second multiplier represents the proportion of income received by individuals from regional sources that is spent and respent regionally. In this case, the values offered by Caffrey and Isaacs range from $.60 to $.80 per dollar of expenditures. The same rationale used to choose values for m_p was used for m_i; for the Providence model a multiplier from the middle of the range was used, and for Rhode Island the highest multiplier value was used.

Multiplier j

Multiplier j represents the number of full-time jobs generated per dollar of direct regional expenditures. For the purposes of this study, the number of jobs ranges from 0.00007 to 0.00009. The larger and more diversified a region is, the easier it is to absorb demand caused by large expenditures with less requirements for labor and capital. Therefore, in this case, the larger the area, the smaller the multiplier. For medium-sized Providence, a multiplier from the middle of the range of values was chosen, and for the large Rhode Island area the lowest possible multiplier was chosen.

Multiplier p

p represents the total amount accruing to local residents from the initial average dollar spent by regional households in the area. This multiplier should vary from $.50 to $.66 per dollar of expenditures. As for the previous multiplier j, the value for Providence was chosen from the middle of the range and the value for Rhode Island from the low end of the range.

REFERENCES

Booth, G. and Jarrett, I. The Economic Impacts of the University of Rhode Island. Kingston, R.I., 1972.

Brown University. The Economic Impact of Brown University on the City of Providence and on the State of Rhode Island. Office of Institutional Research, September, 1976.

Bureau of Labor Statistics, Monthly Labor Review, March, 1979.

Caffrey, J. and Isaacs, H.H. Estimating the Impact of a College or University on the Local Economy. Washington: American Council on Education, 1971.

Federal Reserve Board. "Reserve Requirements on Deposit of Member Banks," Federal Reserve Bulletin. April, 1979.

Providence Journal-Bulletin. 1979 Journal-Bulletin Rhode Island Almanac. 1979.

Providence, R.I. Office of the City Controller. One Hundred Thirty-Second Annual Financial Report of the City of Providence, Rhode Island for the Fiscal Year Ended June 30, 1978.

Rhode Island. Department of Community Affairs. Annual State Report on Local Government Finances and Tax Equalization. 1978.

Rhode Island. Department of Economic Development. Rhode Island Basic Economic Statistics....the Economy, Summary and Trends. 1975.

Rhode Island. Department of Economic Development-Research Division. Rhode Island Major Manufacturing and Private Business Firms. September, 1975.

Rhode Island. Office of State Controller. State of Rhode Island Annual Financial Report. Department of Administration, 1978.

U.S. Census of Business. 1972 Retail Trade--Area Statistics of Rhode Island Cities and Towns. 1975.

U.S. Census of Business. 1972 Selected Service Industries--Area Statistics of Rhode Island Cities and Towns. 1975.

U.S. Census of Business. 1972 Wholesale Trade--Area Statistics of Rhode Island Cities and Towns. 1975.

U.S. Department of Commerce. Current Population Reports, Consumer Buying Indicators. January, 1974.

U.S. Department of Commerce. Current Population Reports, Consumer Income. December, 1973.

U.S. Internal Revenue Service. Statistics of Income, Corporation Income Tax Returns. 1973.